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Science teacher job satisfaction in secondary schools in Chile and its association with student outcomes

Sarah C. P. D. Hean

A dissertation submitted to the University of Bristol in accordance with the requirements of the degree of Doctorate in Philosophy in the Faculty of Social Sciences.

Graduate School of Education

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Author's declaration

I declare that the work in this dissertation was carried out in accordance with the Regulations of the University of Bristol. The work is original except where indicated by special reference in the text and no part of the dissertation has been submitted for any other degree.

Any views expressed in the dissertation are those of the author and in no way represent those of the University of Bristol.

The dissertation has not been presented to any other University for examination either in the United Kingdom or overseas.

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Abstract

This thesis aimed to investigate the nature of, and the relationship between, Science teacher job satisfaction and the student outcomes of attitude towards, and achievement in, science. The context of the study is the urban areas of Coquimbo and La Serena in Chile.

Background characteristics relevant to the context were investigated to improve understanding of the relationships at hand. Inequalities in the educational system were evident in terms of achievement and attitudes to science differ according to the location and administration of the school and science subject.

Teachers' experience of work was related to both their personal characteristics and the context in which they taught with relationships with colleagues, work content, material rewards and physical working conditions being most contributory to overall job satisfaction. Working with students and the role of the teacher as a developer were shown as main sources of satisfaction, material rewards as sources of dissatisfaction.

The psychology of attitude forms the theoretical base of the study and a model relating beliefs, attitudes and behaviour was used as the basic framework upon which the investigation was designed. Results showed that this was of use in the initial exploration of the data and that associations between student beliefs about their teacher job satisfaction, and their own attitudes to and achievement in science are evident. Although the teacher overall job satisfaction scale is not well associated with these student outcomes, teachers' perceptions of, and the value they place upon, the different components of their work environment were of significance. Recommendations for the improvement of teacher working life, in light of these findings are therefore made, especially with reference to the teachers contentment with opportunities for career advancement, work content and material rewards, in the hope that teacher and pupil experience may be improved.

Methodologically, suggestions are made to optimise measurement, specifically in the evolution of the teacher job satisfaction questionnaire, and commentary made on the inclusions of value measures in the measure of job satisfaction.

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CHAPTER 1 INTRODUCTION

1.1. The main research question

It would seem to be common sense that teachers who are more satisfied with their work would be better teachers. This assumption is often expressed in the teacher job satisfaction literature but frequently remains as such, unquestioned. This thesis aims to investigate the validity of this supposition by describing exploratory research into the relationships between teacher job satisfaction and student outcomes.

There is some indication that an association between job satisfaction and student outcomes does exist as evidence relating teacher satisfaction to better pedagogic practice has shown (Perry *et al.*, 1995). Moreover, significant and positive relationships between organisational commitment and job satisfaction on the one hand and organisational commitment and student achievement on the other, encourages this hypothesis (Kushman, 1992) as do associations between student achievement and positive teacher evaluations of school conditions (Arancibia & Alvarez, 1994).

To further understanding of possible interactions between job satisfaction and student outcomes, an established psychological model, used previously in work connecting beliefs, attitudes and behaviour, is employed (Fishbein & Ajzen, 1975). Although this has not as yet been widely used in education, it is recommended as a potentially useful tool in this arena (Kottkamp, 1990).

The approach to the research is, therefore, mainly psychological, concentrating on the inner beliefs and attitudes of the individual teacher and student. However, discussion does attempt to situate itself within the social dimension that teacher and student's experience and within the limitations of the data collected.

1.2. The context

The social dimension in which this research is situated is that surrounding teachers in Chile, a context chosen for several reasons, the first being historical. Chile is in the process of recovery from a period of dictatorship under the military government of General Pinochet (1973-1989). This was an era within which the teaching profession deteriorated in status, working conditions and morale and when inequalities between education in the private and public sectors grew (Aedo-Richmond &Richmond, 1996;

Avalos, 1996a). Although educational reform measures are being implemented, teachers would appear to suffer from continued discontent, as indicated by repeated strike action over the past decade and as read in reports compiled by the main teachers union (Colegio de Profesores, 1997a; 1997b) and elsewhere in the Chilean literature (e.g., Delano *et al.*, 1991; Cornejo & Rodriguez, 1997). These sentiments, viewed in parallel to the focus upon improving both the quality and equity of education, makes this context an interesting one in which to situate an investigation that proposes to determine if links between student outcomes and teacher satisfaction can be made.

If the main priority of the Chilean educational system is to improve the quality of education and the distribution thereof, it is essential to determine what factors will best help achieve this. If it could be shown that satisfaction is related to student outcomes, if only indirectly, then policy aimed at the improvement of the working lives of teachers, seen to a degree in some of the present educational reforms, can be justified. By further identifying which teacher job components specifically are of most importance, reforms can be fine-tuned to develop those most likely to improve the educational experience of the student, as well as the work experience of the teacher.

1.3. Why the teacher?

The challenge arises as to which of the numerous factors that influence student outcomes would most benefit from financial, physical and human capital investment. The number of such factors is vast ranging, from those within the background of the student, such as parental support and the media, to the numerous variables situated within the school itself. This research has chosen to look specifically at the influence of the *teacher* upon the student as it is one factor, being situated within the school, that if found to be of importance, may be more easily manipulated in future educational policy, than those external to it.

Furthermore, any country that seeks to improve its educational system and student performance and implement initiatives to do so, must take into account the beliefs, attitudes and influences of the work force involved, if only to acquire its full co-operation in the implementation of such reforms (Butts & Raun; 1967). Additionally, initiatives that are transferred to the teacher without an understanding of their feelings towards the area being reformed, are likely to meet with teachers failing to implement the procedures at all or doing so in a way not originally intended (Yerrick *et al.*, 1997).

Consider for example improvements in infrastructure, as have been recently accomplished in several Chilean schools. It would seem essential that teachers' beliefs in what and where deficits lie in infrastructure should be consulted, since they are the people who will finally make use of it. Do science teachers see extra laboratory classrooms as necessary? for example. If not, there is little reason to build them, unless of course teacher practice and beliefs relating to laboratory based learning are altered simultaneously. Teachers may also hold particular inappropriate beliefs or attitudes to the subject they teach, the profession of teaching or their particular job. These beliefs and attitudes may reinforce those held by the students themselves, and both may be unproductive. Teachers may have a poor attitude to the curriculum, and hence communicate "unclear, complicated messages, reservations, personal separation and inner discomfort" to their students, (Shirgley & Johnson, 1974). Those that view Physics as exclusively a masculine subject will do little to dispel this attitude amongst their students (Goddard-Spear, 1988). It is transfers of teacher attitudes to students, of which the latter are examples, that this thesis is particularly concerned.

1.4. Why science and the science teacher?

The research about to be described has been narrowed to the confines of the secondary science classroom, investigating the relationships between the satisfaction of a group of science teachers and student achievement. The interaction between teacher and student is not only restricted to measures of students' performance but is extended to their attitude to science also. The latter is an outcome considered of importance not only in its own right, as associated with a student's sense of well being, but also in terms of its relationship with achievement.

The subject of science was specifically chosen for reasons both theoretical and practical. Chilean education faces the challenge of contributing to the improvement of scientific and technological development nationally. Lack of definite policy towards science development and the need to modernise the science curriculum are some of the criticisms made in light of the possible influence of science in social and economic development of society and of the individual (Lewin, 1993). Efforts have been made to try and improve scientific development in the country through the amelioration of science education, the *Red Gacela* programme being one such move in this direction (Sanchez-Jimenez, 1997). Based on the importance of an effective science education

and the moves being made to improve upon this, focusing an investigation on teacher job satisfaction into this discipline makes the study more relevant. It is especially so if one assumes that guidelines to improve science teacher satisfaction might lead to improved science learning in students.

It was felt also that, in any study of teacher satisfaction, there are issues and beliefs that are likely to be peculiar to the teachers of each subject area alone, in addition to those relevant for teachers as a whole. It is maintained that teachers within the same teaching discipline regularly tackle common work activities and challenges related to their discipline and similar physical location in the school. These activities and challenges are likely to be approached to some degree through discussion with colleagues in a language that has developed within the subject environment. This will have an influence upon teacher beliefs and practice (Bidwell & Yasumoto, 1999):

> "Belonging to a little collegium of the pedagogically like-minded should have substantial influencing and stabilising effects on the way a teacher thinks about teaching and actually teaches" (Bidwell & Yasumoto, 1999; p238).

Teachers within a subject who face similar issues and problems and interact with each other and more frequently than they do with other subject teachers (depending on the size of the school) may begin to develop attitudes to their subject and job that could be distinct from that of colleagues in other disciplines. For this reason science teachers alone were addressed in the study so that differences in attitude based upon subject area alone could to some extent be controlled. In science teachers, for example, difficulties revolving round materials and laboratory equipment are likely to be more central than they would be for a history teacher. Restriction of the study to one subject alone, in this case science, allows for themes particular to the culture of this type of classroom to develop more clearly.

Finally, the choice of science teachers for study came from the practical necessity to associate teacher satisfaction with student outcomes in science. To allow the project to assume manageable proportions, a single discipline only need be monitored whereby student attitudes to science and achievement in that subject could be effectively associated with teachers' satisfaction.

1.5. Why job satisfaction?

Educational reform may be divided into two themes: one that is related to the professionalisation and certification of the teacher, and the second that involves initiatives aimed at improving the working conditions and life of the teacher. It has been maintained that the latter approach is the more practical and concrete in offering ways in which the work and productivity of teachers may be improved (Louis & Smith, 1990). In agreement with the latter, the present research addresses issues with which teachers may be satisfied or not, and observes the association this may have with student outcomes. This approach will provide practical and directed measures, interwoven with specific job characteristics, with which to improve both teachers' working lives and the outcomes of students.

1.6. Other issues

Part of developing an understanding of the association between student outcomes and teacher satisfaction involves the construction of a suitable contextual and theoretical background to support the links that are created. In so doing other issues must be addressed.

Job satisfaction is a well-studied theme in the developed world and an established pool of literature already exists in the educational field. There remains a need, however, for the formation of a knowledge base appropriate for developing countries (Garrett, 1999), and Chile is no exception.

This research will also highlight areas of the teaching profession that, in Chile, are the best predictors of overall job satisfaction, which may lead to future job designs that optimise these predictor variables and maximise job satisfaction. Such improvement is worthy of consideration stemming from an interest in teachers as individuals requiring fulfilment within their profession, and in teachers as a group involved in social interaction. Furthermore, improved satisfaction may foster teacher co-operation with present and future reforms to improve the educational system and reduce costly levels of absenteeism and staff turn over.

1.7. Justification of methodology

The methodology employed in this research has been quantitative in its approach utilising survey style questionnaires to collect attitudinal, belief and background data

and tests to collect achievement and natural aptitude information on students. The choice of a questionnaire approach was chosen after observation that much of the literature based on teacher working conditions in Chile, and teacher feelings towards this, is either anecdotal in nature or based upon discussions with small groups of teachers often brought together during training workshops. There is a need to gain a more representational view of what themes may be of concern to teachers in the region in a consistent and reliable format before issues that arise can be further investigated. Questionnaires were felt to be a more effective way of achieving this. Open-ended questions were made part of these instruments, however, to afford teachers the opportunity of responding to questions with greater freedom.

The choice of instrument was also practical. The lens through which the study had been observed was that of the outsider looking in. This has both advantages and disadvantages and whilst the understanding of the native of the cultural, social and political arena would have been wider and deeper, the outsider is better able to view emotive issues and cultural rhetoric with a degree of impartiality not readily available to the local researcher. This investigation presents a particular slant to the analysis at hand, almost certainly different to that of a native Chilean but of value. A problem that does face the outsider researcher, however, is the problem of language, an issue particularly important when techniques such as interviewing are employed. These problems are more controllable using questionnaire type methods.

Instrumentation used in this research was based upon that employed in cross national studies, and applied in a number of contexts, *viz.*, European (e.g. West Germany, England, Poland, Albania)(Poppleton, 1988; Menlo & Poppleton, 1990; Wisniewski, 1990; Poppleton, 1992; Kloep & Tarifa, 1994); Asian (e.g. Japan; Singapore)(Ninomiya & Okato, 1990; Menlo & Poppleton, 1990; Poppleton, 1992); and North American (USA) (Poppleton, 1992). An adaptation and application of the instrument in a Latin American country will give further insight into where similarities lie in teaching as a profession, and the school as an organisation, regardless of context as well as those areas that are culturally bound.

1.8. Design of thesis

This thesis has been partitioned into 10 chapters inclusive of the present introduction. The second chapter that follows reviews the theoretical background to the study. As

student attitudes towards science and beliefs about teacher satisfaction are a focus of the research as is teacher attitude to work, an elucidation of attitude theory is made inclusive of the possible relationships between the beliefs, attitudes and final behaviours of the individual. Student attitudes to science and achievement in science are specifically dealt with as is teacher job satisfaction and the theoretical models associated with this construct.

The third chapter has the objective of presenting the contextual background of the study, namely of the Chilean educational system. The structure of secondary education, the curriculum, teacher training, student evaluation are touched upon briefly as are the general challenges faced by the system and the reform measures that have been implemented to address these. This provides the contextual arena necessary to understand the study and aid in the interpretation of findings.

Chapter 4 presents the main and supportive research questions and justifications thereof in greater detail than have been briefly addressed in this introduction.

The nature and development of instruments employed in the measurement of the constructs of interest are presented in Chapter 5. Sampling procedures, management and ethical issues and limitations of the methods are also described.

Chapter 6 is largely descriptive. It presents an outline of the frequencies of student, school and teacher background characteristics and the interrelations that occur between them in an attempt to create a backdrop against which the nature of teacher job satisfaction, student outcomes and the relationships between them may be held. The distribution of student attitude and belief scales and student achievement are also summarised along with the manner in which they interact with each other and the said background variables. Data collected on teacher attitudes to their work and their interactions with background variables are presented in a similar fashion.

The construct of teacher job satisfaction is more carefully investigated in Chapter 7. Teacher job satisfaction can be viewed in terms of overall feelings of well being in the job or the attitudes they have towards each specific job characteristic. Previous research has pointed to the fact that teachers' satisfaction with a particular attribute is related to the extent to which the characteristic is perceived (reward) and the value placed upon

this (Kalleberg, 1977; Poppleton, 1989). There is some doubt, however, as to how the reward and value components for each job characteristic may interact to contribute to teachers' overall feelings of contentment and, therefore, these interactions and their contribution to overall job satisfaction within the Chilean context has been investigated here. The chief contribution of this chapter is to present a quantitative impression of which characteristics teachers perceive to be the least or most present, the manner in which they may value the different characteristics and how these different measures may influence their overall feelings of satisfaction. It is essential that this be established so that relationships between these levels of satisfaction and student outcomes, found in later chapters, can be better explained.

Although the methodology of the research is quantitative in nature, a minor qualitative slant was introduced in the form of open-ended questions. This was attempted first as a form of triangulation with the quantitative methods that had elicited similar information. Secondly, it aimed to extract freer responses from both students and teachers than might have been drawn from the Likert scales employed in the main measurements. The analysis of open-ended questions addressed by teachers is presented in Chapter 8 and investigates the components of the job with which teachers see themselves as satisfied or dissatisfied. The results are compared with those established quantitatively in Chapter 7 and a classification of the characteristics also attempted for comparison with a well known classification system described by Herzberg's two-factor theory (Herzberg *et al.* 1959).

Chapter 9 finally explores the possible relationships between teacher overall feelings of satisfaction in the job, and their feelings towards individual components thereof, with student achievement. Student beliefs concerning teachers' levels of satisfaction and their attitudes to science are viewed as possible mediators in this relationship and the viability of this proposal tested. Furthermore, the analyses of a second open ended question, this time presented to students, is described in an attempt to understand the perceptions that students may develop of their teachers' job satisfaction. It is proposed that it is through these perceptions that the association between teacher job satisfaction and student outcomes may be made.

The final chapter draws together the findings of those preceding it to give an overview of how teacher satisfaction is related to student outcomes and presents

recommendations as to how the results of the present research may be applied and the limitations of the research that confine these.

The study will show that the teacher perception of the rewards they receive from specific job characteristics, and the value they place upon these, are associated with student outcomes and that there is the possibility that a happier teacher is indeed a better one.

CHAPTER 2 THEORETICAL BACKGROUND

The aim of this chapter is to give a theoretical background to the constructs investigated. Attitude theory is first explored, as a central theme of the study, job satisfaction, is considered an attitude that a teacher holds towards her work and work environment. Moreover, student attitude towards science is one of the student outcomes investigated. A definition of attitude, and the factors that are related to it, need to be considered, therefore, at both a general level in the form of universal attitude theory and more specifically as a discussion of student attitude to science and teacher job satisfaction. Student achievement is also covered as an alternative student outcome.

Consideration must also be taken as to the developmental level of the country in which the school is based as what is effective, affordable and applicable in a developed region may be inappropriate both economically and culturally in a developing one (Lewin, 1993). Keeping in mind, the developing country status of Chile, attempts have been made to draw on literature from the developing world context, where this is available.

2.1. Definition of attitude

Attitude is a concept without a universally accepted meaning. Such is the state of the concept's definition, that some would prefer to scrap the attitude construct altogether rather than continue with attempts to define it (Fishbein & Ajzen, 1975). Some authors have persevered, however, describing attitude as a mental readiness to respond (e.g. Shirgley *et al.*, 1988; Oppenheim, 1992) whereas others see it in more evaluative terms:

> " a learned disposition to evaluate in certain ways objects, people, actions...." (Gardner; 1975; p2).

It is this latter definition that is favoured in this research, the presence of the word 'learned' being seen as of particular relevance to education as it implies that positive attitudes towards study, for example, may be taught, or at least developed or changed through positive social interaction and experience in the school. Some would argue with the specificity of this definition, however. Firstly, not all attitudes appear to be learned. Secondly, the term disposition suggests that attitudes are of long standing when in actual fact they may be short-lived (Eagly & Chaiken, 1993). For the purpose of this study, it is taken that learned attitudes formed within the classroom, that become

established for a period long enough to affect other student outcomes, are of interest, and the Gardner definition taken as acceptable.

The construct of attitude is divisible into components although the exact nature of this dimensionality is a contentious one. A tridimensional concept views attitude as constructed of cognitive, affective and behavioural/conative parts. The *cognitive* component may be interpreted as the knowledge, opinions, beliefs or thoughts of the individual, *affect* as the feelings or evaluation of an object by an individual and *conation*, the behaviour of the individual (Fishbein & Ajzen, 1975). The latter authors further support the differentiation of behavioural intention from actual behaviour, creating a fourth component.

The components contributing to attitude are not considered to contribute equally to the construct, the affective part being seen as the most important (Shirgley *et al.,* 1988). A unidimensional construct has been also proposed, therefore, with the latter constituent as the only dimension (Stahlberg & Frey, 1996).

In this study, the dimensionality of the attitude construct will be considered a unitary and evaluative one, with beliefs, behavioural intentions and behaviours viewed as separate, although related concepts. This decision was made based on the fact that attitude, belief, behavioural intention and behaviour can be clearly and separately defined from each other (Gardner, 1975; Tesser & Shaffer, 1990). Although advocates of the tripartite system may consider this simplistic, a compromise may be reached if focus on the centrality of the evaluative nature of attitude is made.

2.2. Attitude Function

Developing an understanding of the relationship between an individual's attitudes (e.g., of the teacher) and the attitudes and performances of others (e.g., of the student) is the focus of the present research and knowledge of the functions of attitudes, and how they are aroused may be of use. Four main functions of attitudes have been outlined (Katz, 1960).

One purpose an attitude may hold is that of ego defence where it serves to protect the individual from internal anxieties related to his own self image. These attitudes are aroused by some threat to the ego or an appeal to some pre-formed prejudice or

repressed impulse and can be expressed in several ways. Projection is one such option, an example being that of a person protecting herself or her group from negative feelings by projecting these feelings onto a minority group (Katz, 1960). In the teaching sphere, a student, who continually fails in a particular subject, experiences a direct threat to his self-esteem. He may, therefore, develop a negative attitude to the subject, or perhaps even the teacher involved, to explain his failure, rather than accept the possibility of his own lack of ability.

The projection of attitudes is not the only reaction described for ego-defensive individuals, withdrawal from the situation is an alternative behaviour.

The expression of ego defensive attitudes may be socially supported, e.g., a teacher who reacts negatively to low remuneration or status within the profession, conditions of threat to his self esteem, may find his attitudes endorsed by fellow teachers. Expression may also be exacerbated by 'situational frustrations' often unrelated to the attitude and may be changed through removal of the threat to ego, the encouragement of catharsis or self insight of some form into the attitudes he has formed (Katz, 1960).

A second function of attitude is a value expressive or self-realising function whereby people express their own values. Katz (1960) believes this expression of attitude enables people to confirm the validity of their self-concept, the attitudes being aroused by environmental cues that stimulate the need in the individual to reassert this identity. A teacher who values her role in the development of students from lower socio-economic status backgrounds, for example, may develop a positive attitude towards such students in reflection of her value system. These attitudes may be altered if the person is made to feel unhappy with herself, is made aware of the greater appropriateness of new attitudes for the self and/or if old values are undermined in some fashion.

Attitudes may also have an instrumental/adjustive or utilitarian function in that individuals demonstrate positive attitudes to objects that satisfy or reinforce their needs. A teacher who needs to receive constant recognition of the work he does, for example, develops a positive attitude to policy that introduces incentive schemes that reward levels of teacher performance.

The expression of the attitude may in itself also be rewarding or punishing, the instance of an individual expressing similar attitudes to that of a person considered to be socially desirable as a friend, being an example. This social-adjustive function (Smith *et al.*, 1956; Tesser & Shaffer, 1990) is important in the relation of oneself to others. This would be experienced by a student, who otherwise might enjoy science, but finds himself amongst a class that have a poor attitude towards the subject. If the student has a strong desire to fit in, he may alter his attitudinal stance in accordance with those of his classmates.

Utilitarian attitudes are stimulated by the associated need being made salient to the subject and may be altered if the aspirations of receiving rewards or punishment are raised or lowered. An illustrative example is of students that feel they have little prospects of entering university and who at best feel ambivalent towards working well in their academic subjects. If, however, their aspirations are raised, then they may see the reward of working hard at school as attainable and, hence, develop a positive attitude towards this behaviour.

Attitude finally may have a knowledge or economy function where it is assumed that they allow incoming information to be suitably categorised as it enters the psyche. New data can be lain along side established experience and through the evaluative dimension of attitude, complex sets of information, that are continually fed to an individual, are simplified (Katz, 1960). Such attitudes are aroused when new environmental cues associated with an old problem are presented to the individual. A teacher may hold a negative attitude to the materials she has available to her in the classroom and use this attitude to guide her thinking when reform measures begin to increase the provision of school resources. Her attitude may change for the better if this new information on materials (or other environmental factors) is sufficiently and meaningfully different from previously held information, to create some form of ambiguity in her mind and subsequent adjustment to her thinking, i.e., the shortage of materials has been significantly addressed.

This guidance of information processing is seen by some as the central function of most attitudes but only if the attitudes are well established and accessible from memory allowing for their automatic activation when informational processing guidance is required (Fazio, 1989). An attitude to school management, for example, may serve as

means of imposing structure on a teacher's experiences at work but only if this attitude has a 'high likelihood of being activated from memory' when exposed to some stimulus such as a member of the school administration authority. High accessibility of attitude would arise if the evaluation of management was particularly strong and the attitude had been previously established in memory *a priori* to the stimulation event.

The above description of the functions of attitude has been limited to give only a taste of the abundant literature published that expand on these themes. It should be remembered, however, that the functions are not as simplistic as they might seem in this brief account and that the purpose of an attitude may differ depending on the individual, the attitude domain and the situational context (Katz, 1960; Tesser & Shaffer, 1990, Stahlberg & Frey, 1996). The latter authors also believe that attitudes are not unitary in purpose and may serve several functions simultaneously. An example is a positive attitude to the conservation of energy. Such an attitude may on the one hand have a utilitarian function in that it may be approved of by influential others. On the other hand it may represent an expression of the central values of the individual herself (Stahlberg & Frey, 1996).

So too may the possible function of teacher and student attitude be multiple. Students may hold positive attitudes to science so as to receive the approval of their parents or teachers but see such attitudes as an expression of their own values and interests as well. Teachers may have negative attitudes to their pay levels as this reflects their lack of status. This condition may be viewed adversely also because it does not fulfil their economic needs.

Although the approach to the present research will focus more on the relationships between attitude, beliefs and possible behaviour (an approach favoured by authors such as Fishbein & Ajzen, 1975) rather than a functional approach (e.g., Katz, 1960), knowledge of attitude function will shed some light on the associations found between teacher and student attitudes and beliefs in later chapters.

2.3. The Relationship between Attitude and Behaviour

Stahlberg & Frey (1996) suggest that attitudes are so pervasive in the study of social psychology because of the influence on behaviour, a central concept in this field.

Attitudes are seen as predictors of behaviour, and hence a good point to begin, if behaviour modification is desired.

Before embarking on models that describe the relationships between attitude and behaviour, two issues need be brought into consideration. Firstly, although the influence of attitude on behaviour appears to be the more widely researched relationship, the reciprocal relationship is worth bearing in mind (Shirgley *et al.,* 1988). A poor attitude to studying science at school may influence the student's behaviour in such a way that less work is completed and exam results suffer as a result. The reciprocal relationship may be equally valid, i.e. the student, having performed badly in an examination, may develop a poor attitude to the subject involved.

Secondly, the relationship between attitude and behaviour is by no means a consistent one. A student expressing a positive attitude to a science as studied at school on the one hand may work well so as to achieve in this subject, behaviour in accordance with her attitude. On the other hand alternative attitudes or factors may interfere with the behavioural expression of this attitude. She may see achievement in science as unfeminine and, therefore, put in less effort, contrary to her positive attitude. Later discussion of science attitudes and their influence upon achievement (Section 2.5.1.1) will highlight this issue.

Another example could be developed in terms of teacher attitude to work and resultant behaviour in the classroom. This thesis discusses the possibility that teachers' attitudes to work influence their behaviour in some form that would in turn affect student outcomes. Factors such as highly developed feelings of responsibility for student learning, however, may interfere with this relationship between negative attitudes to the work place and final instructional practice.

2.3.1. The Fishbein & Ajzen attitude model

Concern over the attitude-behaviour consistency has contributed to the development of models that attempt to explain the relationship. One such model, of central importance to this research, relates attitude, belief, behavioural intention and behaviour variables. Before a description of this model can be made, however, variable definitions need to be clarified:

2.3.1.1.Belief

The information or attributes an individual associates with a particular object. A typical belief would, therefore, be:

'Science (*the object*) is studied by many people in this school (*the attribute*)'

or more simply

'Apples (*the object*) are red (*the attribute*)'.

2.3.1.2.Belief strength

The strength with which an individual associates an object with a particular attribute is termed the belief strength. People differ in their "perceived likelihood that the object has (or is associated with) the attribute in question." A measure of such strength, called subjective probability by Fishbein & Ajzen (1975), is often used interchangeably as a definition of belief itself.

2.3.1.3.Behavioural intention

Behavioural intention is the aim of an individual to perform a particular behaviour. It could be considered a type of belief where the individual assesses the probability of carrying out a particular action (i.e. the person is the object and the behaviour is the attribute). A strong intention is one where the individual perceives the likelihood of completing a particular behaviour as high. Some researchers consider behavioural intention as the best predictor of behaviour (Fishbein & Ajzen, 1975).

2.3.1.4.Behaviour

Behaviour describes some performance or action.

Continuing from these definitions, Fishbein & Ajzen (1975) develop a conceptual framework in which belief, attitude, behavioural intentions and behaviour are related. Within this model, (and models developed from it) the individual is seen as a rational actor (Tesser & Shaffer, 1990), one that:

> "....is essentially a rational organism, who uses the information at his disposal to make judgements, form evaluations, and arrive at decisions." (Fishbein & Ajzen, 1975; p14).

In this framework, beliefs are seen as the "fundamental building blocks in our conceptual structure". Through contact with the environment we begin to associate particular attributes with objects, hence forming beliefs about them. Fishbein & Ajzen (1975) maintain it is these beliefs that will ultimately determine our attitudes, behavioural intentions and behaviour.

Attitudes develop from the beliefs an individual possesses concerning the object. If the object is associated with positive attributes then the attitude formed will be a positive one and conversely if negative attributes are associated with an object, the attitude formed to that attribute will be negative. If a student associates science with negative attributes such as nuclear warfare, long hours of boredom, or a bad tempered teacher, a negative attitude or evaluation of the subject is likely to form. However, if science is associated with attributes such as disease prevention, entertaining experiments or a dynamic teacher, the reverse should occur.

The model further maintains that the attitude formed does not correspond to a specific belief but instead forms from what could be considered the sum of all beliefs associated with the object. The size of the contribution that each belief makes to the attitude (perhaps best considered the overall attitude to the object) is the product of the subjective probability (that an attribute is associated with an object) (b_i) and the perceived positive or negative evaluation of the attribute (e_i). The following equation (Fishbein & Ajzen, 1975) describes this relationship:

$$A_o = \sum_{n=1}^{n=i} (b_i . e_i)$$ (Fishbein & Ajzen, 1975)

where A_o is the general attitude, n the number of contributing beliefs and i the specific belief number.

If a student strongly believes (or estimates that the probability is high) that boredom is associated with science and gives boredom a highly negative evaluation, then this belief will have an elevated negative weighting with respect to the contribution it makes to the overall attitude towards science. Likewise, a student, although giving a highly positive evaluation of entertaining experiments, may, through her experience of class room

instruction, not rate highly the probability of entertaining experiments being associated with science classes. The contribution of this belief to the overall attitude is not particularly large as a result.

The attitude to the object, in turn, influences the intentions of a person to perform various behaviours. Once again the attitude is related to a set of intentions rather than any single intention. A student holding a moderately positive attitude to science may form a set of behavioural intentions that are, as a whole, moderately favourable. These intentions may differ in their favourability when considered individually, i.e. the student may intend to study hard for the end of year exams, intend to complete all the homework set by the teacher and intend to pay attention in class, three behavioural intentions that could be considered as positive. She would not, however, consider joining an extra curricular science club, a behavioural intention that could be considered negative. The overall set of behavioural intentions is still positive, if evaluated as a whole. Similarly a teacher may express a poor attitude to his job through intentions not to put maximum effort into class preparation or delivery. He may not take any action, however, to leave the profession or school in which he is employed, although demonstrating a generally negative set of behavioural intentions.

Each intention is directly related to a specific behaviour and unless prevented by some unforeseen factor, the person will act out her intentions. As attitude is related to a set of intentions, it is surmised that an attitude is related to a set of behaviours or a behaviour pattern (not any individual behaviour).

The entire model is summarised in Figure 2.01 and includes feedback loops between attitude and beliefs and between behaviours and beliefs. In the former, an attitude once established, may influence the formation of new beliefs (i.e., a positive attitude to science may lead to the subjective probability of positive attributes being associated with the object science being higher than if the general attitude was negative). In the latter feedback loop, a behaviour may lead to new beliefs, which in turn influence attitude. Students behaving in a fashion on a single occasion so as to achieve well in a science test, may then believe that they have an aptitude for the subject, a belief that would contribute to an overall positive attitude to the subject.

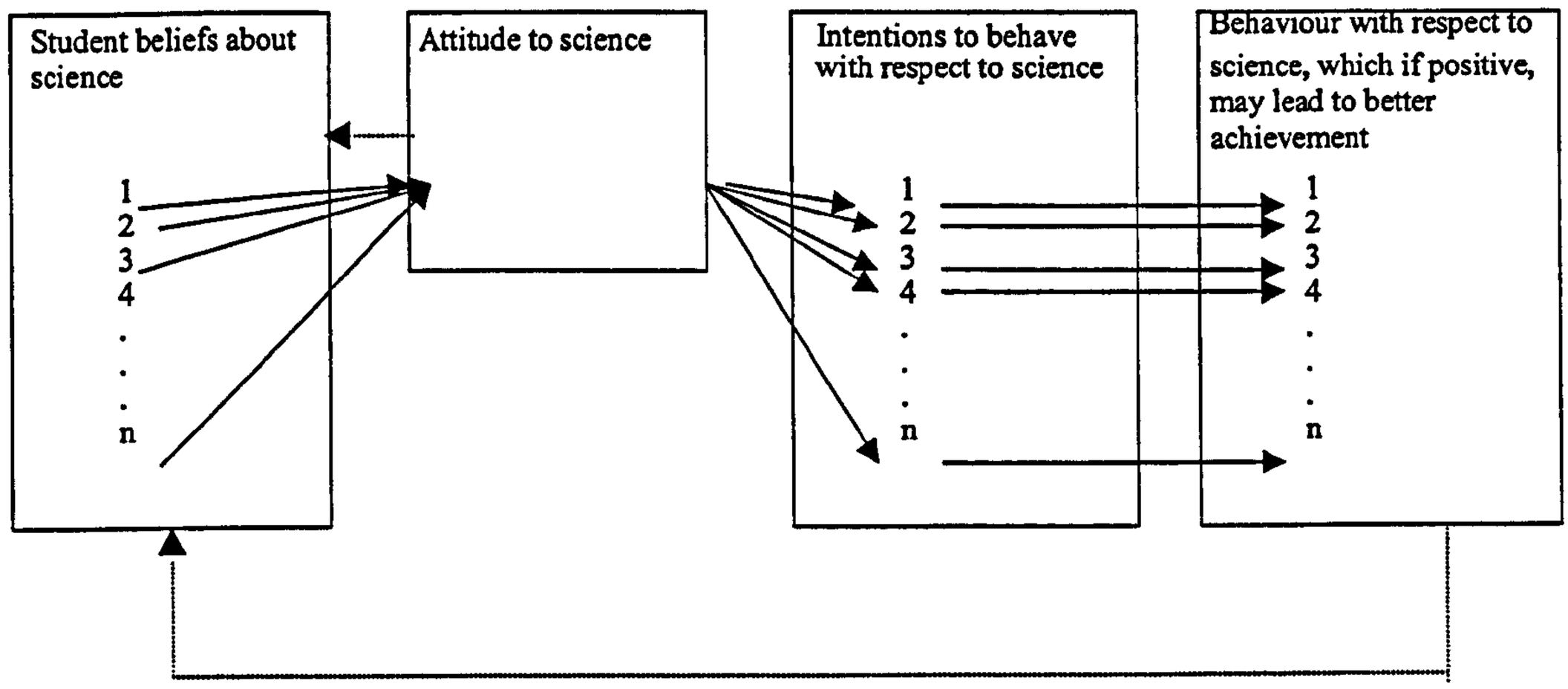

Figure 2.01: Conceptual framework relating beliefs, attitudes, intentions to behave and behaviours with respect to a given object (Fishbein & Ajzen, 1975; p15)

2.3.2. Theory of reasoned action and planned behaviour

Fishbein and Ajzen continued the development of the above model by expanding on factors that may influence the behavioural intentions of the individual (other than the attitude to object X). This theory has become known as the theory of reasoned or personal action, in keeping with the belief that individuals are capable of making conscious deliberations concerning their actions.

It is suggested that a person holds particular beliefs concerning the consequences of a certain behaviour X (e.g. a teacher may believe that arriving late at school will harm his chances of promotion). The subjective probability that this attribute is associated with the behaviour, and the value placed on this attribute, will contribute to the formation of a relevant attitude to the behaviour. As described previously, the weighted sum of all the beliefs concerning the object (in this case behaviour X) will together contribute to the formation of the attitude to the behaviour. A teacher may have several beliefs concerning the consequences of arriving late for school, some of the belief attributes being positive and some negative. The weighted sum of these beliefs will form an overall attitude to arriving late.

In addition to the attitude to behaviour, individuals may be influenced by the expectations of relevant others who wish them to perform or not perform a particular behaviour, e.g., a student holds the normative belief that his parents wish him to pay attention in class or the teacher may be aware of the attitudes of her colleagues to a particular school issue. The individual may or may not be motivated to heed such

beliefs based on the importance of the influential other. The normative belief, and the motivation to comply, combines to form a normative pressure known as the subjective norm. An additional factor, perceived behavioural control, has more recently been added to the model. This can be defined as the individual's perception of how easy or difficult a task is to perform (Ajzen & Madden, 1986). This factor influences behaviour either directly, or indirectly, through behavioural intentions. Figure 2.02 outlines these additional influences upon behavioural intention and behaviour (other than attitude to the attitudinal object as described in Figure 2.01).

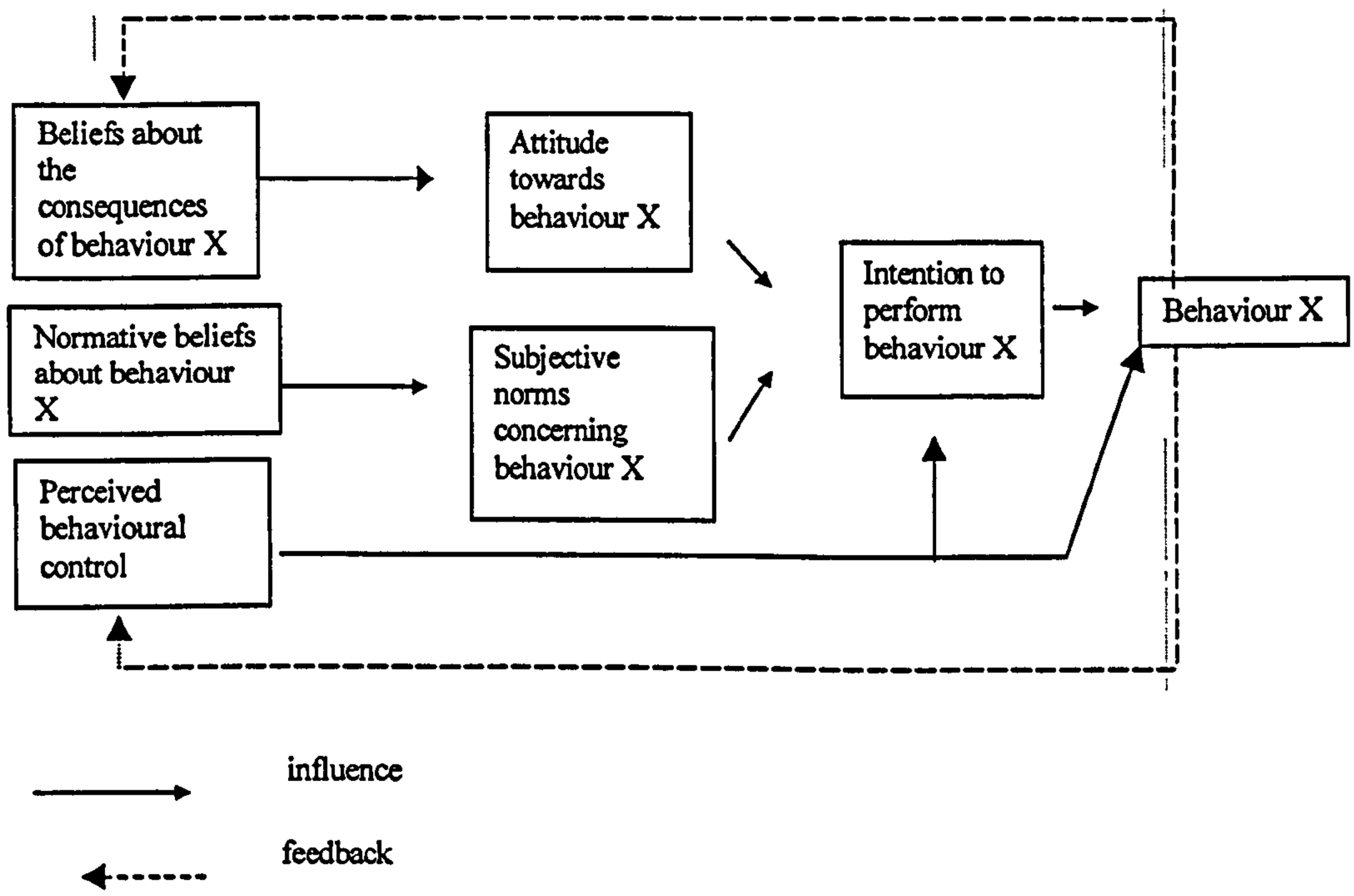

Figure 2.02: Conceptual framework for the prediction of specific behavioural intentions and behaviours (Fishbein & Ajzen, 1975; Ajzen & Madden; 1986).

In the above discussion, it was assumed that the individual is a rational actor when behavioural selections are made. Not all action conducted by the individual is consciously decided upon, however, and in fact there may be situations in which the person behaves automatically, or as a non rational actor (Tesser & Shaffer, 1990). Some believe that attitudes are not active in deciding some such behaviours (Ronis *et al.*, 1989). Repeated behaviours are an example, where habit may become more influential in the guidance of these actions. It is only when a "novelty or adversity in the subject's behaviour" occurs that the individual switches to decision making consciously, a process in which attitude plays a role (Tesser & Shaffer, 1990).

Fazio (1989) disagrees with this, believing that highly accessible[1] attitudes *are* activated automatically and do in fact guide behaviour without the individual being conscious of their involvement. He also maintains that highly accessible attitudes are more likely to be consistent with later behaviours.

In this thesis the study of attitude was restricted to, in the case of students, the attitude towards various aspects of science and in teachers, attitude towards the different components of work. Teachers may be conscious and unconscious of their different behaviours in the classroom and the reasons behind them but, in both instances, attitudes towards particular working conditions, if previously formulated and sufficiently strong, may be influential. Similarly, student behaviour is likely to be partially contingent on attitude if the attitude has these accessible properties. Teacher and students attitudes will now be discussed.

2.4. Attitudes towards science

At the onset of discussion concerning attitudes in science, it is important to make a clear distinction between attitudes towards science and science attitudes. Attitudes towards science are those attitudes that possess a definite object to which the subject may respond favourably or not (a definition in keeping with those previously described - Section 2.1). Examples of such attitudes are directed towards science as a school subject, the science teacher, scientists, the social implications of science, science as a career or scientific inquiry. The second attitude category is a collection of traits which scientists as a group should be seen to hold. Such traits include open-mindedness, honesty, curiosity, rationality, willingness to suspend judgement, critical mindedness, etc. (Gardner, 1975). It is the former, attitudes *towards* science, in which this research is interested.

2.4.1. Variables associated with attitudes towards science

The number of influences on attitude towards science that have been investigated in the literature is extensive and often inconsistent, a fact partially attributable to the numerous contexts under study. Some of the more common are discussed below under the loosely defined categories of factors associated with the personal characteristics of the student and those related to school based features.

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[1]Accessibility is associated with stronger attitude object-evaluation strengths and an established place of the attitude in memory due to the development of the attitude *a priori* to the stimulation event.

2.4.1.1.Personal characteristics

Although students grouped within the same classroom may be exposed to similar stimuli, the attitudes towards science that each develop may differ considerably based on individual characteristics and personal history. Gender differences in attitudes to science are thought to be one of the most important and consistent of variables when considering this variance in attitudes towards science (Gardner, 1975; Schibeci, 1984). Attitudes may be fairly similar in the lower years of primary education (Parker & Rennie, 1986) but boys' attitudes develop more positively as they progress up the school (Comber & Keeves, 1973; Steinkamp & Maehr, 1983; Banu, 1986; Schibeci & Riley, 1986; Simpson & Oliver, 1990). Although disparities increase with educational level, there is a general decline in positive attitude overall across both genders as students advance through the school. In the International Studies in Educational Achievement (IEA), for example, a definite decrease in interest in school science was observed between 10 year old and 14 year old populations (Johnson & Keeves, 1994). Qualitative research confirms this trend (Piburn & Baker; 1993). Furthermore, a decline in interest may be noted within a single year, the greatest decrease shown in the first semester (Simpson & Olivier, 1990). The change in attitude to science with educational level, interacts with student ability, the interest of middle ability groups fading more rapidly than do lower or high ability peers. This is thought to be related to teacher practice where special needs or high ability students receive more attention than do those of average capacity. It is important, therefore, that the attitude of students to science, especially female students, be addressed at an early stage in student education to avoid the poor attitudes seen to develop as students reach secondary school. Programmes that aim to make teachers aware of gender and other biases introduced during science classes are specifically recommended (Parker & Rennie, 1986; Simpson & Oliver; 1990).

Findings, relating attitudes to science with gender, are not consistent across the separate science discipline or teaching methods. Boys, for example, seem generally more interested in the physical sciences and methods involved in physical manipulation and experimentation. Girls are more interested in biological and social sciences and methods involving discussion and questioning (Walberg, 1967; Clarke, 1972). The poor attitude of girls to the physical sciences is emphasised in coeducation, where girls regard physical science as a more masculine preserve than do girls in single sex schools

(Vockell & Lobonc, 1981). In fact, attitudes of girls towards science are in general more positive in single sex schools (Banu, 1986). These differences may be related to sexual stereotyping, the acceptability of female success in the subject and potentially higher performing female students' feelings of being deviant within the science class in the mixed school (Vockell & Lobonc, 1981). It may be argued that issues of gender have been remedied since the research conducted in the 1970s and 1980s but more recent research (Stark & Gray, 1999; Jones *et al.*, 2000) show that disparities between male and female students continue, as demonstrated in distinct interests in the different subjects, in experiences out-of-school and in views of science as a future career.

Student socio-economic status has been associated with student attitudes as have other variables associated with home background such as parental interest (Gardner, 1975). Family type variables, however, do not always correlate with attitudes to science as highly as expected although family support of science and the influence of the parent on the student of the same sex are still viewed as relevant scales (Simpson & Oliver, 1990). Some findings negate the influence of socio-economic status altogether (Banu, 1986).

Attitudinal differences amongst students of different ethnic origins have been described (Simpson & Oliver, 1990) and, using wider horizons, studies have shown that students in different countries to vary in attitude, attitude being better in those nations where active initiatives exist in the promotion of science and technology (Keeves, 1992).

A review of the relevant literature concluded that students with certain personality characteristics, such as being "relatively serious, achievement orientated, realistic and independent, but conventionalist and conformist" are more likely to hold positive attitudes to science. Environmental variables, however, interacted with such personality traits in so far that it was only when the teacher exhibited encouraging behaviour that positive attitudes were sustained (Gardner, 1975).

There is a tendency to consider student achievement as the dependent variable in an attitude-achievement relationship but there is research that supports the possibility of the reverse (i.e., that achievement affects attitude) or reciprocal relationship. (Schibeci & Riley, 1986; Wick & Yager, 1966; Steinkamp & Maher, 1983; Keeves, & Morgenstern, 1992).

Individuals may hold other, possibly conflicting beliefs or attitudes that interact with their attitude to science, the attitude held towards a science teacher being one example (Wick & Yager, 1966). Student fatalism, their perception of the importance of science, enjoyment of science by one's classmates and class organisation may also be worthy of consideration (Haladyna *et al.*, 1983). The students' attitude to the curriculum and the attitude to their physical environment are further factors that have been found to be associated with attitude to science as have self concept and achievement motivation (Simpson & Oliver, 1990).

Attitudes to science are shown to improve when students perceive themselves to have more control over their lessons and mental and physical activities. Suggestions have subsequently been made that programmes which encourage the practice of meta-cognitive techniques, teaching students to be more aware of their own processes of thinking, learning and the management, thereof, prevent the development of negative attitudes to science as well as assisting in learning (White & Mitchell, 1994).

Cognitive ability has not been shown to be associated with attitude to science (Steinkamp & Maher, 1983).

2.4.1.2.School based factors

Although students may develop attitudes specific to themselves, there are factors that may have a common effect upon them as a group. Social influence, for example, is considered of great importance to the formation of attitude (Salancik & Pfeffer, 1978) and the attitudes of others within the school or classroom environment. The student's best friends or peers are, therefore, likely to be influential (Simpson & Oliver, 1990). Communities low in apathy, cliqueness and friction measures but high in satisfaction with their schoolwork, contain students with more positive attitudes (Walberg, 1969). Student cohesiveness, class integration, rule clarity, open-endedness and the material environment are other measures of class climate that may contribute to student attitudes (McRobbie, 1993).

The influence of the teacher specifically, rather than that of peers, is the main interest of this present study. It has been argued, and supported empirically, that teachers must have a positive attitude to science to encourage similar attitudes in their students and that students will adopt an attitude to science similar to that of their teacher (Wards,

1975). Goddard Spear (1988) provides evidence for this by demonstrating that the views of teachers and pupils concerning the difficulty, importance and masculinity of the physical sciences were similar. This, she suggests, indicates that teachers' views may at least reinforce those already held by students. A lack of relationship between teacher and student affect has been demonstrated elsewhere, however (Simpson & Oliver, 1990).

Actual teacher behaviour rather than their attitude, may be of importance, with long periods of teacher class preparation (Elliot, 1971), amount of homework given (Schibeci & Riley, 1986), good organisation, achievement motivation and enthusiasm (Gardner, 1975), teacher warmth and external demand placed upon the students by the teacher (Reed, 1961) all positively correlating with student attitudes. Not all relationships are linear with teacher expectations of the student, for example, showing a U-shaped relationship, with excessive demands made by the teacher resulting in student anxiety and confusion. Behaviours that involve the use of more formal teaching methods and teacher directed activity that reduce the emphasis on objectives and evaluation or that encourage passivity in the student are also found to be associated with poorer attitudes although certain teaching methods may be differentially preferred by students of different genders (Gardner, 1975; Stark & Gray, 1999). The use of laboratory instruction is one teaching method put forward as a form of instruction that may encourage positive attitudes as it is seen a social and entertaining activity by science students (Piburn & Baker, 1993; Freedman, 1997). The nature of the laboratory work under study is important, however, as the mindless following of instructions by students during laboratory exercises may reduce interest or enjoyment of the subject (White, 1996).

Overall, therefore, the teacher's influence upon student attitude to science would seem important, a fact with which Gardner (1975) is in agreement. He concludes:

> "...if science educators are serious about developing pupils' interests in science, they will have to switch their attention to changing teachers' behaviours which influence pupils' attitude....." (Gardner, 1975; p30).

It should be remembered at this juncture, however, that in considering the effect of the teacher, it cannot be assumed that the teacher will have identical influences on each

individual student (Gardner, 1975) especially in consideration of the many personal characteristics of the student that influence their attitude, as has been already discussed.

2.4.2. Outcomes of attitudes towards science

One outcome of an improved attitude to science may be improved achievement. This relationship is of central interest to this study and will be discussed more thoroughly in the next section. Although achievement appears to be the most common student outcome associated with attitude in the literature, other outcomes such as future participation in further science study and involvement in a science related career are possible outcomes of positive attitudes to science also. As might be expected, attitude to science correlates positively with such variables (e.g. Simpson & Olivier, 1990; Atwater *et al.*, 1995).

2.5. Student science achievement

Achievement in science is the second student outcome under investigation in this study. Many critiques are available that question whether achievement is fairly assessed in school in terms of the methods used, whether the curriculum being tested is related to the external and later world requirements of the student and/or if certain student groups are discriminated against by the achievement measures used. These criticisms need to be borne in mind but for the purpose of this research, improving student achievement in schools as it now stands and is measured, regardless of whether one agrees with its validity or not, is the focus. Issues and factors that influence student science achievement will be discussed in this light.

2.5.1. Factors associated with achievement

Student achievement in school is an extensive area of study and the aim of this section is again to give an indication only of a few of the issues and influences. As in the review of factors influencing attitude, factors affecting achievement will be classified into the categories of personal characteristics and school based characteristics.

2.5.1.1.Personal characteristics

Where attitude towards science has been demonstrated in some research to be more influenced by school, especially classroom related variables, such as climate, the physical environment, the teacher and peers, science achievement tends to be related to variables more associated with self (Simpson & Oliver, 1990). One such variable is that

of the first student outcome described, student attitude towards science. Following from the attitude-behaviour models discussed (Figure 2.01 and 2.02) it is possible that attitudes towards science (although not alone in this respect) may have a direct influence on a set of behavioural intentions and indirectly on a set or pattern of behaviour conducive to improving or inhibiting achievement. However, as the theory of reasoned action and planned behaviour make clear, behavioural intentions are affected by other factors, such as the opinions of others and perceived behavioural control that could interfere with this relationship. It is not surprising, therefore, that a verdict on the association between attitude to science and achievement in science is undecided, evidence being published for and against it (e.g., for: Billeh & Zakhariades, 1975; Simpson & Oliver, 1990; Freedman, 1997; Aghadiuno, 1995; Germann 1988; Schibeci & Riley, 1986; Steinkamp & Maher, 1983; and against: Wick & Yager 1966; Wynn & Bledsoe, 1967 as quoted by Johnson & Keeves, 1994). Where significant correlations are found between achievement and attitude, the relationship is often moderate or low in nature (Fraser, 1982). Although this is anticipated when considering the variables that may interfere between the attitude and the expression of behaviour, the interference does not lessen the importance of attitude or its relationship to achievement. Maximising positive influences where possible (attitude for example) and minimising negative influences on achievement is a major aim of the educational establishment.

The relationship between attitude towards science and achievement is not always positive with higher science achievers in some contexts reporting, perhaps due to boredom, the least positive attitudes towards the subject (Baker, 1985).

Several other factors such as the grade of student studied, the field of science observed and the type of attitude to science measured may mediate in the relationship between attitude to science and achievement. Differences also exist depending on whether science is a compulsory or elective subject as a choice in taking the subject may lead to a selectively biased sample being used. Different attitude measurement techniques, with varying validity and reliability, also account for some of the discrepancies, as may differences in the type of achievement test used (Germann, 1988). Different methods of calculation during meta-analyses may also account for some of the discrepancies found (Johnson & Keeves, 1994).

Measures of student affect and cognition, other than attitude towards science, are relevant to student achievement, correlations between students' belief of science as being beneficial, their understanding of the nature of scientific inquiry, their participation in science activities, attitudes towards school and school learning and a school motivation scale measuring effort and involvement in school learning being significant (Comber & Keeves, 1973). Students' self concept and anxiety in science, persistence, need achievement, test and achievement anxiety and study habits are other variables (Kahn, 1969; Kremer & Walberg, 1982; Simpson & Oliver, 1990; Freedman, 1997) as are students' analytical (Aghadiuno, 1995) and cognitive abilities (Steinkamp & Maher, 1983).

Gender differences have been found in some studies with boys out performing girls especially in Physics, the latter possibly being contributed to by the perception of Physics as a masculine subject (Comber & Keeves, 1973; Steinkamp & Maher, 1983). Differences between girls and boys are least in Biology, with girls often achieving better in this subject (Keeves & Kotte, 1996; Stark & Gray, 1999). Performance in Chemistry appears to be on a par (Stark & Gray, 1999).

Socio-economic status and family background is considered one of the most important of the factors contributing to variance in student achievement (e.g., Comber & Keeves, 1973; James & Pafford, 1973; Kremer & Walberg, 1982; Coleman, 1990) especially in developed countries where the impact of this variable is such that school-based characteristics pale in comparison. In support of teacher effectiveness research, however, of which the present study is part, Coleman (1990) does acknowledge that the social environment of the student in school, which includes the student-teacher interaction, is next most important in explaining achievement. Furthermore, in developing countries research shows that school based factors are still of some weighting (Heyneman & Loxley, 1983; Saha, 1983). This difference between the effects of socio-economic status in countries of different development has been questioned (Ridell, 1989) after the use of more sophisticated and contemporary statistical methods now available in quantitative research. Student home background from a western-non western perspective may also be related to science achievement with possible contradiction lying between a non western culture and a science curriculum that is largely western in origin (Baker & Taylor, 1995).

2.5.1.2.School based factors

Although student family background may be a large contributor to variance in science achievement, the developing country status of Chile encourages one to continue to explore some of the school-based factors that have further explanatory power. Some research points to the importance of resourcing schools adequately, the provision of textbooks and instructional material, for example, in improving achievement in science (Fuller & Heyneman, 1989 as quoted by Walberg, 1991). It is only an assumption, however, that teachers would use the material provided, as suggested by findings that Chilean teachers often held negative or neutral attitudes towards text books, did not use them or had not been trained in how to utilise these resources (Psacharopoulos & Woodhall, 1985 as quoted by Walberg, 1991). Feeding programmes, school library activities and the length of the instructional programme are also associated with science achievement as are years of teacher training, teacher salary, reduced class size and grade repetition (Heyneman & Loxley, 1983). Again inconsistencies in results occur, the advantages of class reduction, for example, being limited to classes with low initial numbers (e.g., reductions from 12 to 5 students have been shown to be effective although those in larger class groupings have not) (Walberg, 1991).

The inclusion of a laboratory in science instruction is another school based issue that has been often addressed, although there is no consensus on how effective laboratory work is in the actual improvement of student learning in science (White, 1996; Freedman, 1997). This is especially the case in a developing country where the advantage of a laboratory needs to be weighed against the cost effectiveness of the enterprise (Walberg, 1991; White & Mitchell, 1994). The presence of a laboratory assistant in a school also has been related to science achievement (Comber & Keeves, 1973).

The size of school has been shown to be associated with science achievement with larger schools generally showing better performance. This variable interacts with other factors, however, such as location (rural/urban) and the amount of resources available (Comber & Keeves, 1973; Clarke, 1972). Science achievement is also greater when schools make the transfer from primary to secondary education at a slightly higher age (Warburton *et al.*, 1983), a factor also influential in the attitude of the student, as is the flexibility of the school with respect to discipline (Comber & Keeves, 1973).

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If one focuses more specifically on the influence of the teacher within the school, teacher personal characteristics such as the extent of post secondary education, gender and subject association membership have been associated with science achievement (Comber & Keeves, 1973). Teacher behaviours demonstrated in teaching style employed may also play a role, the best achievement in science being found in countries where teaching styles combined explorative as well as authoritative methods (Kelly, 1980).

Teaching methods have been associated with science achievement in cross-country studies although the variables of influence differed from one country to the next. The use of audio-visual materials, within class grouping and the teacher's perception of the importance of the official curriculum are some examples of teacher behaviours and beliefs connected with higher student performance in some regions. The amount of science homework given is also a variable worthy of consideration (Comber & Keeves, 1973).

Teacher understanding of, and attitude to, the subject are factors also found to have a significant relationship with achievement (Aghadiuno, 1995).

Stepping outside the science achievement arena to student academic achievement in general, teacher expectation of student performance is of relevance and can be influenced by several student characteristics ranging from physical attractiveness, social class, race and behaviour to prior record information held on the student (Dusek & Joseph, 1983).

Related to teachers' expectations of student performance are their feelings about their own ability to teach the students with whom they deal. Ashton & Webb (1986) have shown that teachers, working with lower achieving students and who report high levels of personal efficacy, (i.e. they believe themselves capable of teaching their students successfully), display behaviours in the classroom distinct from their colleagues who have *little* belief in their own ability to teach these types of students. As far as achievement was concerned, higher sense of personal efficacy teachers were shown to have students that achieved better in some subjects although not in others, indicating the context or subject specific nature of these teacher attitudes. The idea has been put forward that the teacher's sense of efficacy is translated into warm and accepting

behaviours in the classroom and may induce a sense of efficacy in the student. This encourages student behaviours that improve interactions with the teacher and create a general enthusiasm, both of which have a positive effect upon achievement (Ashton & Webb, 1986).

Finally, Hoy & Hannum (1997) demonstrated positive correlations between achievement and organisational climate scales measuring academic emphasis in the school, teacher affiliation, collegial leadership and resource support.

2.6. Job Satisfaction

The research questions addressed in this thesis aim to associate the teacher variable of job satisfaction with student outcomes, specifically student attitudes to and achievement in science. Job satisfaction is a popular and wide area of research in socio-psychology and more recently in the educational spheres.

Poppleton (1988) divides the study of job satisfaction into two main paradigms: the psychological in which satisfaction from the perspective of individual perceptions, cognitions and characteristics are involved and the sociological in which the social context of satisfaction is considered, the interaction of the individual in relation to the organisation and the processes of teacher socialisation into the culture of teaching being relevant. The present study approaches the topic largely from a psychological perspective in that the individual teacher characteristics, responses and effects are the main focus of the study. This choice was made on the assumption that each individual perceives and reacts to the workplace uniquely and, therefore, it is at the level of the individual rather than the organisation that interactions between student outcome and teacher job satisfaction are considered. Having said this, however, some feelings and reactions may be shared and if reforms are to be effectively introduced so as to improve the lives of the majority, the study of shared experiences in a more sociological approach becomes equally important. Furthermore, much of the teacher's satisfaction may come from his social interactions with members of the school and the community and this cannot be ignored.

2.6.1. Definition of job satisfaction

A job has been defined as 'a complex interrelationship of tasks, roles, responsibilities, interactions, incentives and rewards' and it is likely that employees will have an attitude

about most of these aspects of the job (Locke, 1983; Berry & Houston, 1993). Satisfaction with one's job is considered to be a type of attitude (Vroom, 1964; Berry & Houston, 1993), a psychological tendency to evaluate one's work in either a favourable or unfavourable light (Eagly & Chaiken, 1993) and is open, therefore, to interpretation through the models presently available to attitude theory.

As attitudes in general are often perceived to have or be connected with an affective, cognitive and behavioural component, so can job attitude be seen to have the same dimensionality:

- **Affect** (e.g. a positive or negative evaluation of the pay received as a teacher);
- **Cognition** (e.g. the level of pay a teacher believes she receives in comparison with that received by other professions of similar educational levels);
- **Behaviour** (e.g., poor pay may cause a teacher to be frequently absent, to quit his job or reduce the quality or quantity of work) (Berry & Houston, 1993).

Job satisfaction may also be perceived as a unidimensional concept that involves the affect component of attitude only, as definitions of job satisfaction as an affective orientation to work (Vroom, 1964; Kalleberg, 1977) will support. As with attitudes towards science, this latter definition will be accepted in this research although the interactions with cognition and behaviour remain important.

In defining satisfaction, it is important to be aware of the issues raised by Evans (1997) who discusses the continued conceptual ambiguity of the term. She suggests that when subjects are asked about what brings them satisfaction in their job, they may interpret this in two very distinct manners. One interpretation is of satisfaction as meaning *satisfying,* which she redefines as job fulfilment:

> "A state of mind determined by the extent of the sense of personal achievement which the individual attributes to his/her performance in those components of his/her job s/he values."(Evans, 1997; p327)

A second interpretation of satisfaction is in terms of *satisfactory,* a component redefined as job comfort, which describes the level of comfort that a subject might feel in his/her job. Job comfort derives from factors that are:

" (not) perceived by the individual as being a result of his/her own achievement" (Evans, 1997; p327).

In considering the different attributes of a teaching job, a teacher may feel that she personally has contributed to the achievement of her students and find this very satisfying. In contrast, she may have little control over the resources available to her school and, therefore, if these are adequate she may view them as satisfactory rather than acquiring any positive satisfying feelings from the fact. Both feelings, however, are appropriate for attention in research that seeks to associate them with student outcomes.

2.6.2. Other Definitions

There are some terms that form part of the job satisfaction construct, that require clarification before further discussion is attempted.

2.6.2.1.Job reward

A job reward describes how much of a particular characteristic an individual *perceives* to be present in his job. Actual job characteristics and the perceived job characteristic or reward should be treated separately.

2.6.2.2.Job Value

The job value is the importance an individual places on the presence of a particular job characteristic in her working life. The extent to which she perceives a characteristic to be present may be determined by the value which she places upon its presence (Poppleton, 1989).

2.6.2.3.Job component versus overall satisfaction

Job component or facet satisfaction is the satisfaction an individual feels with a single characteristic of his work (e.g. interaction with colleagues or pay). It should be differentiated from an overall job satisfaction described as an overall affective orientation to all aspects of the job (Kalleberg, 1977).

2.6.2.4.Professional versus work satisfaction

Professional satisfaction may be defined as the level of satisfaction or gratification of the teacher in practice in relation to her personal realisation and recognition in the career she has chosen. This may be distinguished from work satisfaction described as the level of satisfaction experienced by the teacher in practice, in relation to the conditions in which she practices the profession (Cornejo & Rodriguez, 1997).

2.7. Components of job satisfaction

Individuals may be satisfied with certain aspects or components of the job but not with others and a wide proportion of the literature has consequently been aimed at measuring employee perceptions of a list of facets that researchers believe describe full work experience. Such components are often assessed on their contribution to overall feelings of well being in the employee.

A list of job facets related to job satisfaction is presented below, based upon that created by Ronan (1970) in a review of job satisfaction studies across different populations and organisations.

2.7.1. The content of, actual tasks performed and the control of work.

The acquisition of and appropriate utilisation of skills and knowledge related to the subject and profession, the intellectual stimulation provided by the task at hand, the variety and significance of the task and the control (autonomy) the teacher has over the task are some job components related to the nature or content of teaching that may stimulate job satisfaction (Kalleberg, 1975 as quoted by Poppleton 1989; Nias, 1981; Louis & Smith, 1990; Hill, 1994; Lam *et al.*, 1995).

2.7.2. Leadership style, management and the organisation

Workers may exhibit preference for particular leadership styles and suggestions are made that two forms of leadership are worth considering contextually, namely considerate leadership and leadership that initiates task structure (Berry & Houston, 1993). Within the educational field, the role of the principal in teaching is often targeted, the ability of this individual to get people to work together, for example, and other teacher perceptions of this individual being significantly associated with job satisfaction (Culver *et al.*, 1990; Ninomiya & Okato, 1990).

Whilst commitment to teaching is an important predictor of job satisfaction, the sense of community within a school is also of consequence (Verdugo *et al.,* 1997). It has been demonstrated that the greater the extent to which schools develop communities depends on the degree to which teachers give legitimacy to the governing regime in the school. This feeling of legitimacy is in its turn directly associated with job satisfaction. Such findings lead Verdugo *et al.* to conclude that it is not so much the organisation type of the school (bureaucratic or communitarian) that is an issue in the study of job satisfaction but whether teachers felt the school government to be legitimate. The teacher's ability to participate in the decision-making processes also has an indirect effect on job satisfaction (Ninomiya & Okato; 1990) although these conclusions are by no means universal (Taylor & Tashakkori, 1995)

2.7.3. Opportunities for advancement and personal growth

Teachers gain satisfaction from the opportunities teaching provides for personal achievement and professional growth (Nias, 1981; Poppleton, 1990) with job scope, activities, such as conference attendance, opportunity for promotion, the fair allocation of the latter and adequate recognition being relevant (Ninomiya & Okato, 1990; Poppleton, 1990).

2.7.4. Pay, other financial benefits, status and recognition

In the teaching arena the importance of pay and external rewards causes some dissension. Salary has been shown in some studies to be related to the manner in which teachers feel generally about their jobs (Lee *et al.,* 1991) whereas in others salary increases are of no importance to career satisfaction (Chapman, 1983). Non-financial remuneration such as benefits may also play a role (Black-Branch, 1996a).

It is difficult to know if teachers express honestly their attitudes towards job components as some may respond in a fashion based on the appropriate rhetoric they have learnt (Nias, 1981). Alternatively they may respond in such as way as to justify their perseverance in the profession (Salancik & Pfeffer, 1978). Reported satisfaction with salary is clearly vulnerable to these distortions, teacher salaries being generally accepted as poor. Teachers may mark the importance of pay as low in causing them satisfaction to explain to themselves why they entered and still remain in the profession.

Additionally, they may have picked up the rhetoric of society that sees teachers as service orientated individuals unmotivated by large economic gain.

Dissatisfaction with salary may also reflect discontentment with status, the perceived status of the job having been shown to be an influential factor in teacher job satisfaction (Lam *et al.*, 1995). On the status theme, head teachers gain job satisfaction largely from what they believe will bring them success in the eyes of others (Hayes, 1996) and similarly, respect received is an essential component of Japanese teacher job satisfaction. (Ninomiya & Okato, 1990). Recognition in general has also shown to be strongly related to teacher career satisfaction (Chapman, 1983).

2.7.5. Working conditions

Pleasant, adequate surroundings and a congenial organisational climate have been associated with job satisfaction (Ninomiya & Okato, 1990; Wisniewski, 1990; Abu-saad & Hendrix, 1995) as has a work environment free of constraint, obstacles to teaching and burdensome routines (Abu-saad & Hendrix, 1995; Taylor & Tashakkori, 1995). A decline in mention of work conditions as a source of satisfaction occurs as teachers become more advanced in their careers and may be explained in terms of the teacher having learnt organisational rhetoric that stresses that satisfaction in the teaching profession derives from child-centred activity rather than more externally based job facets. Alternatively, there may be nothing within the conditions of work that is sufficient to create any feeling of satisfaction (Nias, 1981).

Limited relationships have been found also between measures of consensus within the school and job satisfaction, with the assumption that consensus reduces unpredictability in the organisation and promotes feelings of stability (Koopman-Boyden & Adams, 1974).

2.7.6. Student characteristics

It is imagined that scales related to the student would be central to teacher satisfaction, as teaching these students is the main purpose of the profession. Despite this, the exclusion of a student component in many teacher related job satisfaction studies is a severe criticism made of such studies based upon what has been described as the uncritical transfer of instrumentation from the organisational and industrial psychology arena to that of education (Kottkamp, 1990).

There is a tendency for teachers to report a connection between their satisfaction and classroom or task-related events, experiencing gratification when they felt they had influenced students. They also mention dealing with young people or people in general as an attraction of teaching (Lortie, 1975; Nias; 1981; Galloway *et. al.*, 1985). Student behaviour, discipline, ability, friction between students in the class and the relationships between the teacher and her students are some specific factors that may be of influence (Smilansky, 1984; Taylor & Tashakkori, 1995).

2.7.7. Co-workers

Teachers gain satisfaction not only from working with students but also from the relations they form with adults such as fellow teachers. This characteristic can be a source of both satisfaction and dissatisfaction (Lortie, 1975; Nias, 1981; Smilansky, 1984; Galloway *et al.*, 1985; Culver *et al.*, 1990). It is unfortunate, therefore, that Ashton & Webb (1986) report that conditions in which teachers in the USA presently work, discourage professional involvement and are such as to foster isolation

2.7.8. Work load

Several authors (e.g., Smilansky; 1984; Mercer, 1997) find the workload placed upon the teacher in terms of the number of classes and the amount of marking, preparation or administration to be related to teacher job satisfaction.

2.7.9. Other

Other scales of interest include satisfaction with the opportunities for participation in activities that are associated with administrative responsibilities and student progress and relationships between the school and the community (parents, for example) (Poppleton, 1990).

The categories described above are by no means fixed, as each study tends to include, if not new categories then novel recategorisations of the dimensions within them. Job components may also change as the profession evolves over time. It is important to point out that each teacher is likely to perceive every job facet in a manner unique to his own personality, characteristics and experience.

2.8. Personal characteristics of the worker associated with job satisfaction

The research about to be described in this thesis proposes to investigate the individual subjective perceptions of teachers of their workplace and profession. In other words, the manner in which two individuals view and react to the work characteristic described in Section 2.7 may be very distinct. One teacher may report to be actively dissatisfied with student behaviour at his school, for example, because he believes it could be improved. Another teacher may report satisfaction with student behaviour in the same school, as she is either resigned to the situation and sees it as unchangeable or in fact of little importance. Put more succinctly:

> "...no matter how pervasive particular aspects of a shared social or occupational culture may be or how well individuals are socialised into it, the attitudes and actions of each teacher are rooted in their own ways of perceiving the world" Nias (1989; p14).

A review of how the personal characteristics of a teacher may interact with her satisfaction is, therefore, necessary.

Evidence suggests that personalities prone to negative emotionality and self-concept are more likely to report dissatisfaction regardless of context (Watson & Clarke, 1984). Furthermore, work with twins, brought up apart, has shown that there might be genetic factors that contribute to job satisfaction (Arvery *et al.*, 1989). The association between natural predisposition to view things negatively and job satisfaction may not be overwhelming, however, as, although personality dispositions may contribute to satisfaction, they do not overshadow situational variables completely (Arvery *et al.*, 1989; Levin & Stokes; 1989).

Positive relationships have been found between age and job satisfaction (Weaver, 1980; Galloway *et al.*, 1985; Berry & Houston, 1993). Age is also found to moderate the relationship between job satisfaction and an employee's beliefs that there are better work alternatives available to them, job satisfaction being higher when individuals perceive alternatives to be scarce. In fact, having viable alternatives may make employees restless and forestall job satisfaction. Job satisfaction is affected less by work alternatives in older employees and various suggestions are made to explain this.

Firstly, the value systems of the mature worker may differ to those held by younger employees and the former may, hence, be less bothered that there are alternative jobs available, finding job attributes of value within the profession, characteristics perhaps not of similar importance to the younger worker. Alternatively, older workers may be equally bothered that there are better jobs available but rationalise remaining in the profession in terms of the position they have reached in the organisation or the amount of time they have invested there in. Thirdly, older employees may be more resigned to their jobs and be aware that they will have more difficulty, because of their age, in obtaining new employment (Pond & Geyser, 1987; Berry & Houston, 1993).

It may be argued, however, that it is not age but the associated career level or phase, that is the influential factor in job satisfaction. Three stages of a career may be identified: the establishment, middle/advancement and final maintenance stage. It is feasible that attitudes to the job change as the career level changes and that individuals that are in the maintenance phase (and more likely to be older) experience more job satisfaction than younger individuals still in the establishment stage. The increased satisfaction in later career phases may be related to increased power, confidence and status associated with the positions held by these individuals, assets unavailable to new entrants (Kacmar & Ferris, 1989). It should be remembered here, however, that teaching does not have the same clear career hierarchy of many other professions although the satisfaction and influential job characteristics influencing head-teachers, for example, are often isolated as separate areas of study (e.g., Hill, 1994; Mercer, 1997).

In some job facets a U shaped relationship may exist between age and satisfaction with individuals of middle age being less satisfied than their younger and older counterparts. This was specifically true for extrinsic components of the job, which tend to be under the control of the organisation. The relationship between career phase and intrinsic job satisfaction in the job, more under individual control, are linear and positive in nature (Kacmar & Ferris, 1989).

The U shape relationship between career phase and satisfaction has been demonstrated within the teaching field with such an association between the time a head teacher has held her post and her satisfaction being noted by Mercer (1997) with mid career heads showing less satisfaction than heads of lesser and greater duration. The relationship between new- and mid-term post head teachers and satisfaction was explained by the

initial enthusiasm associated with a new post that gradually dwindled when sources of dissatisfaction begin to outweigh those causing satisfaction.

Teacher experience is another variable associated with teacher satisfaction. Teachers in England, with less than five years of experience have been found to be more satisfied with their jobs than teachers of greater experience (Poppleton & Riseborough, 1990a). The opposite trend was noted in Japan, however (Ninomiya & Okato, 1990), with no or little difference being found by authors such as Nias (1981) and Galloway *et al.* (1985). In her study of primary school teachers, Nias (1981) finds that there was not a great deal of difference between the satisfaction of teachers in the transition from early to mid career but that there was a tendency for the very experienced practitioner to display higher satisfaction. This was confirmed by Black-Branch (1996) that puts forward two explanations for this trend. Firstly, as teachers become older and more experienced those that are unhappy will move away from the profession, leaving behind a group biased towards higher satisfaction. Alternatively as teachers become more experienced they learn skills that make them better able to deal with a variety of different teaching situations that younger, less experienced teachers have not learnt. These improved skills may lead to better satisfaction.

A higher level of education is another factor reported to influence satisfaction. A better education is predicted to create greater levels of expectancy of what should be present in a job and it is highly likely, considering present day job availability, that such expectancies are not fulfilled as young people enter the job market. Furthermore, it is probable that young workers enter employment for which they are over qualified, a situation contributing to their job dissatisfaction (Weaver, 1980; Berry & Houston, 1993). Related to expectancy, it has been shown that teachers with a lower achievement record were more satisfied than colleagues who were higher achievers, individuals perhaps who had higher aspirations for their career paths (Culver *et al.*, 1990).

Employee gender is an issue. In many instances, women in the work place receive poorer salaries and are employed in jobs where intrinsic satisfaction is lower. It is, therefore, contrary to expectation that some studies show that female job satisfaction is not lower than their male colleagues (e.g., Weaver, 1980). One explanation for this is that women workers expect less of their employment than do males, and, therefore, the discrepancy between what is expected and received is not as high as might be thought.

Alternatively, value systems may differ between the sexes, with males valuing facets such as autonomy and extrinsic rewards highly and females valuing facets such as social rewards. Also of interest are findings that indicate that women in segregated professions show less job satisfaction than those in mixed gender professions (Berry & Houston, 1993).

Studies into teacher job satisfaction and gender are often discordant with reports of teacher job satisfaction in secondary schools in England finding women to be more satisfied than men (Poppleton & Riseborough, 1990a), the opposite trend being noted in Japan (Ninomiya & Okato, 1990) and no or little difference reported by other authors such as Nias (1981) and Black-Branch (1996) also in the United Kingdom. In cross-country studies, a difference in teacher job satisfaction by gender is found to be one of the most discriminating variables (Poppleton & Riseborough, 1990a).

Differences in job satisfaction by race show that ethnic minorities or races exposed to prejudice show lower levels of job satisfaction (Weaver, 1980). This is explainable by way of the poor work alternatives and lower pay available to such groups. If raised educational levels leads to high expectancy, as previously predicted, then lower job satisfaction is understandable when these individuals are forced into jobs, due to racial bias, for which they are overqualified and/or do not meet with their expectations (Berry &Houston, 1993). An interaction between gender and race has been noted (Culver *et al.*, 1990).

2.9. Possible consequences of job satisfaction

Job satisfaction may be associated with certain outcomes, which will now be discussed. The possibility that some of these variables may alternatively be antecedents to the construct should be remembered.

2.9.1. Productivity

Inconsistencies are demonstrated when levels of production are predicted from ratings of job satisfaction. These may be attributable to the use of different criteria when measuring productivity (Ronan, 1970) or the large number of factors that have an affect on both job satisfaction and productivity (Berry & Houston, 1993).

Often no relationship between production and satisfaction is found at all. Walsh & Tseng (1998), for example, investigating a model that tried to link active effort at work with job characteristics via the intermediary of job satisfaction, found no direct link with job satisfaction and concluded generally that workers prepared to make active effort may or may not be satisfied with their working conditions, but were willing to exchange effort for recognition and voice in what was going on. Alternatively, observation of the reverse relationship (i.e. that productivity causes job satisfaction) has been suggested by Locke (1970). The relationship between job performance and satisfaction may also differ according to the nature of the employee involved, the satisfaction of temporary employees being illustrative of this with the satisfaction of such workers being more likely to be associated with their performance than their permanently employed colleagues (Ellingson *et al.*, 1998).

The productivity of the teacher is of interest as it is for employees of any sector. As the productivity of a salesperson may be assessed in terms of her annual sales, the productivity of the teacher may arguably be measured in terms of student attitude and achievement. It should be borne in mind, however, that although teachers may on the one hand be seen as employees within an organisation, the business and teaching environments are very different (e.g. the teachers isolation from adults) (Barnabé & Burns, 1994).

2.9.2. Absenteeism and Turnover

Related to the concept of productivity, absenteeism and high turnovers within the work place are components of employee withdrawal, a situation associated with low job satisfaction. Managers seek to avoid both these situations as it is costly to the organisation in terms of recruitment and retraining, the exception being the turnover of poor performance employees (Berry & Houston, 1993).

With regard to absenteeism individuals dissatisfied with work itself are more frequently absent and for longer periods (Hackett, 1989). The relationship between satisfaction and turnover may be more complicated with dissatisfaction appearing to be a better predictor of turnover in poor performers, with a lesser influence being exerted on high level performers (Spencer & Steers, 1981). Other factors such as the recognition of the performance she achieves may influence the more effective worker's decision,

competition with poor satisfaction, in the factors that she will consider when deciding to remain in her position.

In teaching, job satisfaction and commitment are important predictors of withdrawal cognition, the latter defined as the thoughts and feelings of leaving the teaching profession (Lam *et al.*, 1995). Studies that focus on reasons teachers leave the profession provide useful indications of sources of dissatisfaction and teachers' reactions to it. Similarly the reasons teachers enter teaching in the first place are also of interest as such research gives directives as to either the type of people that enter the profession or alternatively an idea of their original aspirations that may be frustrated when meeting with the reality of school life.

2.9.3. Teacher behaviour in the classroom

Although in this thesis actual teacher behaviour has not been investigated, there is the assumption that job satisfaction influences teacher behaviour in such a way that students are either positively or adversely affected. There are studies that support relationships between satisfaction and teacher behaviour although often the behaviour is generally assumed to result in satisfaction rather than the reverse.

It has been argued that happier, more satisfied teachers will be more likely to accept and implement new educational programmes. In addition, teachers satisfied with their working life might be expected to employ better pedagogic practices in the classroom. Such questions have been addressed in investigations reviewing the relationship between teachers' perceptions of the quality of their work life on the one hand and their pedagogic practices and willingness to undertake innovative educational practices, on the other (Perry *et al.*, 1995). It was concluded generally that the:

> "Quality of life precedes pedagogic practice in time suggesting that quality of life may help shape teacher classroom behaviour" (Perry *et al.*, 1995; p124).

In fact, 21% of the variance in instructional processes could be attributed to the teachers' perceptions of their quality of working life. The authors continue, however, that:

"...impacts are likely to be indirect and depend on a larger set of conditions being present". (Perry *et al.,* 1995; p124).

The relationship between teacher perception and pedagogic practice may be extended by suggesting that as pedagogic practices affect student achievement, then the alteration of teachers' perceptions to their quality of work life could be a means of maximising student achievement (Perry *et al.*, 1995). Furthermore, Saha (1983) finds in a review of 6 studies investigating the association between teacher attitude to her job and student achievement, that 2 show positive results, the remainder showing no effect.

A negative relationship has been shown to exist between total job satisfaction (as well as job satisfaction specifically with teaching and students) and antisocial behavioural alteration techniques used by the teacher to maintain control of the classroom environment (Plax *et al.,* 1986). These authors tended to view the behaviour employed by the teacher as causing satisfaction, but they did allow for the possibility of mutual causation whereby the teachers' satisfaction is influential in determining the frequency and type of strategy used to control students. An experienced teacher, low in job satisfaction, for example, might resort to antisocial techniques in the classroom because she is predisposed to beliefs that the students are resistant to learning and that the teaching experience is an unrewarding one.

Furthermore, satisfied teachers have been shown to be sensitive to student needs and demonstrate behaviours that enable them to maintain discipline in the classroom. In contrast dissatisfied teachers have poorer disciplined classrooms, are less sensitive to student needs and were less clear when introducing their subject matter (Perry *et al.*, 1995).

A connection was found between the effectiveness and appropriateness of teachers' behaviours and satisfaction, in research that describes teaching as an active relationship between student and teacher or a communication-orientated activity (Graham *et al.*, 1992). It has been proposed that if communication competence results in the achievement of goals, this leads to a more satisfying teaching experience that in turn leads to a greater perception of one's own behaviour as being more appropriate and effective (Graham *et al.*, 1992). The reverse could equally be true for the purpose of the present study.

Measures of immediacy defined as verbal and non-verbal behaviours that lessen the psychological or physical distance between individuals (Mehrabian, 1969 as quoted by Graham *et al.*, 1992) were also related to greater job satisfaction. Such links were explained in terms of behaviours representing greater involvement with the students that produce a more satisfying teaching experience. An equally valid interpretation might have been that a teacher more satisfied might be more predisposed to becoming actively involved with their students (Graham *et al.*, 1992).

Similarly, moderate associations of career satisfaction with teacher ratings of their own skills, abilities and the importance they place upon some of these for their own professional success, have been made. (Chapman, 1983).

The use of negative humour in the classroom was also associated with job satisfaction, used by teachers perhaps as a means of regaining control over the classroom environment and managing stress. Dissatisfied teachers in the same study were found, in contrast with their satisfied colleagues, to use non-verbal immediate behaviours, to feel they used inappropriate behaviours and were thought to be teachers perhaps more prone to burn out (Graham *et al.*, 1992).

Finally, teachers' beliefs concerning the quality of their work environment, the kind of students they taught and their authority in total school management are associated with the implementation of differing instructional strategies. Students responded to these strategies by selecting class participatory strategies aimed at fitting in with the instructional strategy used by the teacher (Namuddu, 1989).

A general conclusion, can be drawn from the above discussion, that relationships exist between the level of job satisfaction reported by teachers and the behaviours they display in the classroom

2.9.4. Teacher sense of efficacy

Efficacy, described as a:

> "..person's perceived expectation of succeeding at a task or obtaining a valued outcome through personal effort." (Lee *et al.;* 1991; p191),

has been correlated with teacher job satisfaction (Ashton & Webb, 1986; Lee *et. al.*, 1991; Abraham, 1994; Lam *et al.*, 1995). This association may be an important one as teachers' sense of efficacy shapes the way they view their students, high sense of efficacy teachers seeing their low achieving students as teachable and worthy of teacher effort whereas those with a low sense of efficacy blaming their own failings as a teacher upon the characteristics of the students. Teachers' instructional style is also affected by this variable as is student achievement (Ashton & Webb, 1986).

2.9.5. Stress, Self image and Commitment

Teacher job satisfaction and teacher stress levels are negatively correlated (Borg & Riding, 1991). This is not a consistent finding, which leads to the conclusion that stress and satisfaction are distinct variables, satisfaction appearing to be caused by factors more intrinsic to the job and stress more closely associated with external factors (Smilansky, 1984). Better teachers report higher levels of stress. Positive correlations have been noted between teachers' reports of job satisfaction and their positive self-image (Borg & Riding, 1991)

Teacher commitment is also strongly related to teacher job satisfaction (Culver *et al.*, 1990), measures of job commitment in turn being significantly associated with achievement (Rosenholz, 1989).

2.10. Models of and perspectives on job satisfaction

There are many models that try to relate job satisfaction and components thereof to external factors within the work environment. A brief description is made here of some models that were found to be of most use in the present research.

2.10.1. Precognitive/post cognitive models

There is speculation as to whether an affective response to a job facet may precede the perception thereof, cognition of the characteristic developing subsequently to justify the affective response made (pre-cognitive model). Alternatively, job characteristic may be perceived first with affective evaluations developing in response to these observations (post-cognitive model) (James & Tetrick, 1986). Evidence is presented in favour of the latter, i.e. that cognition precedes affective response, a finding in line with the Fishbein/Ajzen model in which beliefs precede attitude formation (Fishbein &Ajzen,

1975). In the research presented in this thesis, therefore, it is assumed that teachers perceive the job attribute first and subsequently develop satisfaction to it. However, once the satisfaction is formed other perceptions related to the school may change so as fit in with these sentiments.

2.10.2. Herzberg's Two Factor Theory

This is one of the better known satisfaction theories (Herzberg *et al.*, 1959) which attempts to classify different job characteristics according to their ability to either cause satisfaction or dissatisfaction. In so doing, these authors distinguish between two kinds of worker's needs, which if satisfied, have two conclusions:

One set of needs is associated with a healthy, safe, secure work environment. These are called hygiene factors or dissatisfiers, which are composed of needs associated with extrinsic job characteristics (e.g. pay, job security, relationships with superiors, administrative practices, working conditions, status). Hygiene factors, if perceived to be adequate, are thought to be effective in dispelling job dissatisfaction, but do not, according to Herzberg, bring about job satisfaction itself, merely an absence of dissatisfaction.

The other set of needs is linked with personal growth and development and is associated with intrinsic job characteristics called motivator factors or satisfiers (e.g., achievement, recognition, responsibility and promotion). These are considered an integral part of the job itself. Motivator factors and result in job satisfaction but similarly their absence does not bring about job dissatisfaction, rather a state of non-satisfaction. The former extrinsic factors are thought to be short lived in their effects whilst intrinsic factors tend to produce more long-term effects.

The theory assumes that the individual has both type of needs and that the inclusion of adequate levels of both, within the work situation, would increase worker performance.

The two-factor theory has been criticised, however, (e.g., King, 1970; Nias, 1981, 1989). Nias (1981), working with teachers, does not favour a complete rejection of the theory but believes the hygiene/extrinsic, motivator/intrinsic classification to be too simplistic. She supports Herzberg's findings in that factors that cause satisfaction

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(satisfiers) are often intrinsic but notes that nearly a quarter of the teachers involved in her research derive satisfaction from external sources also (Nias, 1989).

Nias proposes that a third category, negative satisfiers, be included in the classification system. Efficiency of administration, congeniality of colleagues, levels of participation and communication are members of this group and have two possible outcomes. If the levels of negative satisfiers are perceived by the teacher to be adequate, a situation that would favour good teaching, job satisfaction would result. Lack of these factors make good teaching difficult, and job dissatisfaction an outcome.

Nias also suggests that factors, which in other occupations relate to job context, appear in education to be intimately bound to the nature of the work itself. Factors, which have hitherto been viewed as extrinsic to work, should, in teaching, be intrinsic and, in this light, the two-factor theory stands. Relationships with colleagues, for example, in other professions such as engineering, may be considered external to the nature of the work. In the service industries, such as teaching, however, interaction with colleagues on issues such as departmental organisation, discussion of teaching strategies or a particular problem child, may be very much part of the job of teaching even though it stands outside the classroom itself. Furthermore, some job facets may be extrinsic to certain teachers but intrinsic to others (Nias, 1981), e.g., salary levels may be considered extrinsic in the average classroom teacher's life but intrinsic to the role demanded in the working life of a teacher who has taken on the simultaneous role of union representative.

King (1970) is more damning in his critique, claiming that the theory behind the model is not a consistent one, with several interpretations thereof in existence. The development of the theory is also criticised methodologically as it is a concept supported only when the techniques of measurement used by Herzberg are employed.

Evans' comments on the conceptual ambiguity of the term job satisfaction shed further light on this discussion (Evans, 1997). She views Herzberg's hygiene factors as characteristics of a job that subjects perceive to be *satisfactory* or linked to job comfort. Motivator factors, each associated directly or indirectly with personal achievement, are in fact perceived as *satisfying* to the individual, contributing to his/her sense of fulfilment. This may explain why later studies (Nias, 1981, for

example) find extrinsic factors causing satisfaction. These extrinsic hygiene factors are presented to the researcher by subjects who have interpreted job satisfaction in terms of job comfort. Those who interpret it in terms of job fulfilment will present factors that are more intrinsic or motivator-like in nature and related to their own achievement. Even the same characteristic may have different meanings to different subjects. An appropriate example is one explained by Garrett (1999), in a discussion of Evans' theory: a contented atmosphere amongst teaching staff members may be a source of job comfort to most teachers, but to the management that were involved in creating this atmosphere, it may be a direct source of job fulfilment. Herzberg would perhaps have been supported by a greater number of researchers, if he, and researchers that followed, had made the above distinction between the constructs of comfort, fulfilment, satisfactory and satisfying (Evans, 1997).

Despite criticism, the two-factor theory still remains in use largely because it supports the possibility of job design and enrichment where motivator and hygiene factors are maximised to ensure job satisfaction and job performance.

2.10.3. Social Influence Hypothesis

The social influence hypothesis suggests an approach that considers the social context in which an individual formulates an attitude towards her work place. The attitude is developed as a result of her consideration of several socially influenced criteria, taking the view that reports on job characteristics are not given but personally assembled (Salancik & Pfeffer, 1978).

The individual reporting her attitude on work adapts the statement she makes about her attitude based upon the social context in which she finds herself. One illustration is the employee who, when, faced by a complex work environment to which she does not know how to respond, observes and assimilates the job attitudes of colleagues, in similar positions.

An attitude may also be transformed or formed based on the need of the individual to justify the reasons for past actions, e.g., entering or remaining in the teaching profession. People need to justify their behaviour so as their behaviour is seen as explainable, socially acceptable and meaningful. Such justifications are constrained by the social environment in which they exist. One example is the development of positive

attitudes to intrinsic job dimensions in professions where external rewards are low. Salancik & Pfeffer (1978) suggest that in these professions legitimate reasons for remaining in the profession are required. The development of a good attitude to internal dimensions is the result of attempts at such a justification. This may be extrapolated to the consistent findings that teachers find the intrinsic part of their jobs more rewarding than extrinsic rewards such as pay (Lortie, 1975; Nias, 1981). As the latter is absent, it is necessary to justify remaining in the profession by developing a positive attitude to intrinsic dimensions such as working with children.

Commitment to behaviour is associated with justification processes also. Workers that are irrevocably committed to remaining in a profession, and have few options to leave, are more likely to develop positive attitudes to work based on their need to justify their behaviour of remaining in the profession. This may again explain why some research has shown older teachers, who perhaps feel they cannot afford to leave their jobs at this stage of their lives and careers, to have better attitudes to the job (Gutierrez Sanchez *et al.*, 1997).

A further point that needs be considered is the issue of salience. Depending on the social context in which the attitude is formed, certain dimensions are made salient than others. Actual measurement processes, for example, draw attention to possible problems or dimensions of the workplace towards which the individual had previously only very minor attitudes. These characteristics being brought to the attention of the worker as a potential problem area may cause him to report and/or develop an attitude more negative and stronger than it would have been in other circumstances (Salancik & Pfeffer, 1978).

When discussing the social context in which attitudes are formed and reported, a review of the assumptions of an ecological analysis seems appropriate. Such a review has been made by Ashton & Webb (1986) for a study of teacher's sense of efficacy but may be adapted here for application to a job satisfaction study:

Teacher job satisfaction is a function of an interaction between individuals and settings (i.e. a function of the interaction between teachers, their colleagues, their students and the school environment in which they live). Teacher job satisfaction may be affected indirectly also by those outside of the school environment, e.g. co-operation from

parents, respect from the community. The above description of the social influence hypothesis and the normative influence described by Fishbein & Ajzen (1975) are relevant here.

Teacher job satisfaction is context specific. (i.e., a teacher may be very satisfied with the characteristics of students they teach in one school but feel dissatisfied when teaching a group in another institution). A specific example in the Chilean context was given by Gysling (1992b) of a teacher shown to present irresponsible and demotivated behaviour in one school in which he worked, demonstrating opposing behaviour in a second.

The above ecological generalisations are valid also in descriptions of student behaviours and performance in science.

Based on each unique context and the individual experiences of reality of teachers and students to classroom events it may be said to make it very difficult to establish valid relationships between teacher attitude (job satisfaction) and student outcomes investigated here. In defence of such attempts, it is hoped that teachers and students share some similar experiences of the reality of classroom interaction, that will enable reform measures to improve teacher job satisfaction and hereby student outcomes, to at least some degree.

Gysling (1992b) states that we learn the meaning of any entity through an interaction with others. This leads to shared meanings and the development of a so-called inter-subjectivity. Teachers, she states, are likely to share certain meanings as a result of being exposed to a common social structure of school life. This creates the culture of the teaching profession that may guide and position teacher thoughts and actions.

Finally, behaviour in social settings are also reciprocal, i.e., job satisfaction may lead to behaviour that influences student achievement. Equally, good student achievement may contribute to teacher satisfaction.

2.10.4. Value Discrepancy Model

The Value Discrepancy, and other related models, make consideration of the different job components present in work and have the advantage over models that view satisfaction as a function of personality alone; inadequate because they ignore the

influence that job characteristics have upon satisfaction. Models that view satisfaction only in terms of the influence of job characteristics, however, (e.g., the two-factor theory) ignore that different people will experience and value identical job characteristics differently depending on what their histories and expectations from work life have been (see the ecological analysis described in Section 2.10.3). The inclusion of a value component to the equation caters for this (Kalleberg, 1977).

To elaborate upon this, Kalleberg (1975 as quoted by Poppleton, 1989) suggests 3 reasons why individuals may consider or value various job components in different ways:

- Differences in the socialisation and other life experiences of individuals before they enter the job in question;
- Differences in non work social roles which may place constraints on the individual when developing her own meaning of the job;
- Differences in work experiences that affect the mature worker's evaluation of the potential rewards associated with work.

The value discrepancy model proposes that the level of overall job satisfaction of an employee is determined by the difference he perceives there to be between what he desires from a job and what actually is received. The impact of this discrepancy upon overall job satisfaction is dictated by the value placed by the individual on each facet of the job (equation 2.01) (Locke, 1983). In other words, the contribution of the calculated discrepancy (Received-Desired) to overall job satisfaction, is weighted by the importance placed on each job facet being measured. The greater the importance (assuming it is a positive measure) placed upon the job component and the lower the discrepancy between received and desired rewards, the greater the contribution of the job component to overall job satisfaction.

Overall job satisfaction = Σ (Received - Desired) * Importance

Received = The amount of the job characteristics that the teacher perceives to have been received or to be present in the job;

Desired = The amount of the job characteristic the teacher wishes there to be present;

Importance = The value placed on the job characteristic.

Equation 2.01: Overall job satisfaction as predicted by the value and the discrepancy between perceived and received reward variables (Locke, 1983)

The equation is not, however, without complication. Firstly, in the measurement of values an individual may not always be fully conscious of these and, secondly, a value placed on one particular facet may, in fact, not be an independent judgement but 'operate within a person's total value system' (Locke, 1983). Evans (1969) also describes a tendency of respondents to rate all job facets of equal importance.

The discrepancy or (received-desired) part of equation 2.01 also has been criticised as respondents based on the 'psychological constraint' are found rarely to rate received rewards greater than desired rewards (Wall & Payne, 1973) . Furthermore, the multiplication function is questioned (equation 2.01) on the basis of evidence that demonstrates value and reward variables to contribute independently to overall job satisfaction. Additionally, the predictive power of value variables in relation to overall job satisfaction is much less, and often insignificant, than that of rewards, a fact that is not accounted for in the equation, where rewards and values are given equal weighting. The contribution of value may also, for some job dimensions, be a negative one, i.e., the greater the reward or job facet is valued, the less likely it will be that these values are fulfilled. These problems cast some doubt upon the validity of equation 2.01 (Kalleberg, 1977; Poppleton, 1988).

An additive linear model or linear regression equation (equation 2.02) has thus been recommended where valuations of job components contribute independently from rewards to overall job satisfaction and are appropriately and separately weighted. The difference between perceived and received rewards is also ignored (Kalleberg, 1977; Poppleton, 1988).

$$\text{Overall job satisfaction} = a + \sum_{i=1}^{i=n} b_i R_i + \sum_{i=1}^{i=n} c_i V_i + e$$

a = the constant of the regression equation

R_i = the reward or perceived presence of a job facet i (and not a discrepancy score);

b_i = partial regression coefficient of reward i, indicating the relative contribution of this reward to job satisfaction;

c_i = partial regression coefficient of value i, indicating the relative contribution of this value to job satisfaction;

V_i = the value or importance placed on job facet or dimension i;

e = standard error

Equation 2.02: Overall job satisfaction predicted by an additive combination of value and reward variables (Kalleberg, 1977; Poppleton, 1988)

The inclusion of an interaction variable between values and rewards rather than a totally independent value variable may further be considered. This is based on the assumption that the amount of reward perceived and reported is already tempered by the value with which the component is held in the first place. This supposition is described by the equation 2.03:

$$\text{Overall job satisfaction} = a + \sum_{i=1}^{i=n} b_i R_i + \sum_{i=1}^{i=n} c_i V_i R_i + e$$

a = the constant of the regression equation

R_i = the reward or perceived presence of a job facet i

b_i = partial regression coefficient of reward i, indicating the relative contribution of this reward to job satisfaction

c_i = partial regression coefficient of the effect of the reward variable i as the value of the reward to the individual increases

V_i = the value or importance placed on job facet or dimension i

e = standard error

Equation 2.03: Overall job satisfaction predicted by an additive combination of rewards and a rewards-value interaction variable (Kalleberg, 1977; Poppleton, 1988)

The collinearity between the reward (R_i) and interaction ($R_i.V_i$) variables is of some concern, however (Kalleberg, 1977). Furthermore, neither Kalleberg nor Poppleton find overwhelming evidence for the inclusion of the independent interaction variable.

Poppleton (1989) has shown generally that the value variable of most job components does not contribute significantly to overall job satisfaction, whether in the form of an interaction or independent variable, and suggests, therefore, that reward measures may already contain measures of value within their scores (an implicit weighting). From a measurement perspective this would mean that rewards alone can be measured in determining job components that contribute most to overall job satisfaction. Some caution still needs to be exercised in disregarding values altogether, however, as work looking at the importance of value or importance ratings (Johnson & Holdaway, 1994) was inconclusive and warned that:

> "Until the redundancy of importance measures can be settled conclusively, this study has cast sufficient doubt on the implicit weighting theory's applicability to education that researchers would be well advised to investigate levels of overall job and facet satisfaction *as well as* perceptions of importance in studies of educators' job satisfaction" (Johnson & Holdaway, 1994; p31).

2.10.5. Teacher Professional Satisfaction (TPS) Study

Reward/value measures, as described above as attributes of satisfaction, have been applied in the educational sphere in a series of investigations, the Teacher Professional Satisfaction studies (TPS), aimed at making an international comparison of the work perceptions of teachers (England, USA, Japan, Singapore and West Germany) (Menlo & Poppleton, 1990).

Three facet specific scales that described teaching practices, teacher roles and responsibilities and teacher working conditions were examined. These three facet specific scales were considered independent variables that were likely to be specific to the culture studied. Three facet free scales, overall job satisfaction, work centrality and occupational stress were also considered. These scales were considered to be dependent variables, and as facet free, useful in cross-country comparison. Two further scales were considered to further account for the complexity of job satisfaction. These were

personal/demographic characteristics of the teacher and school characteristics. The variables were interrelated as shown in Figure 2.03.

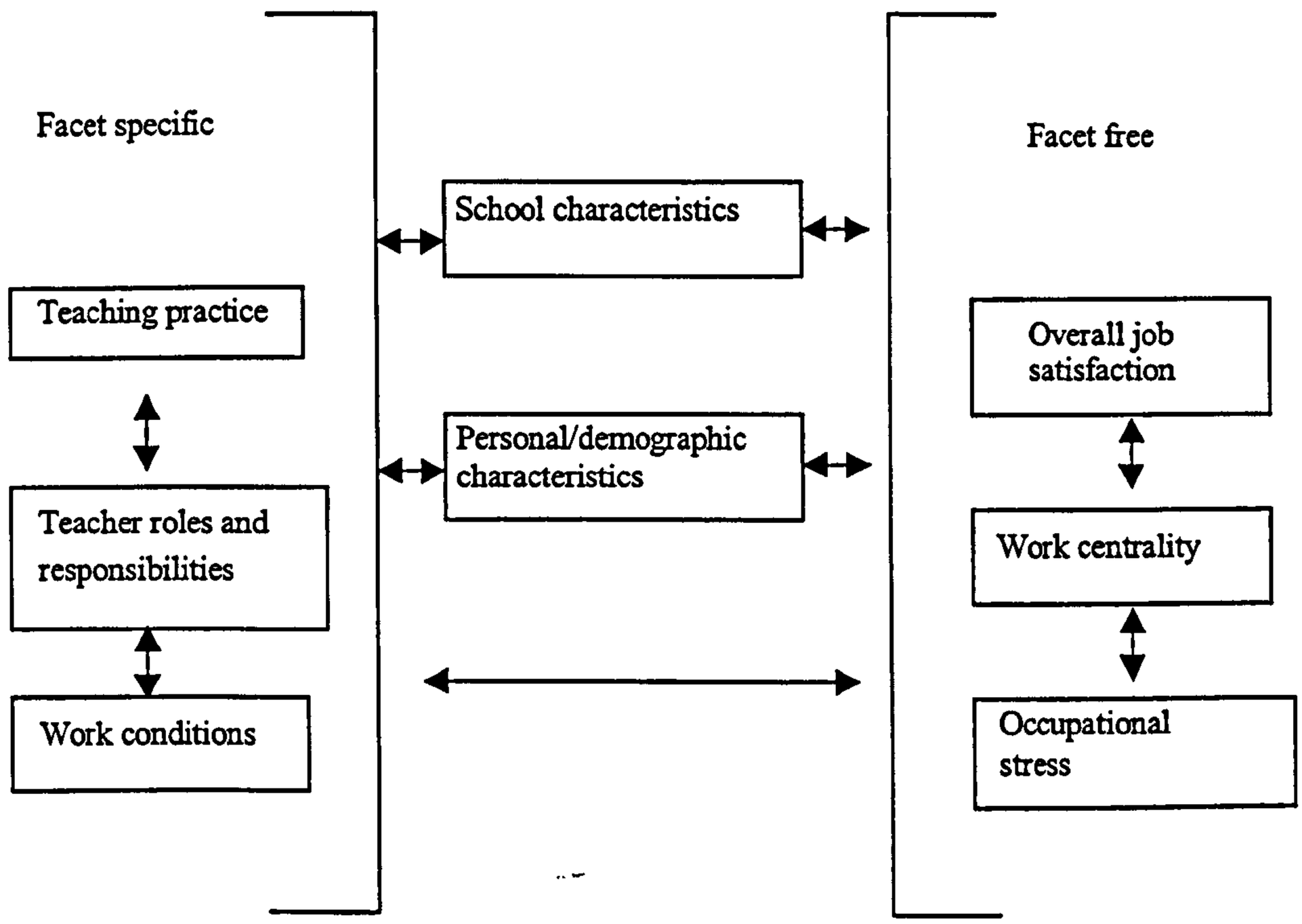


Figure 2.03: Research model used in TPS Study (Menlo & Poppleton, 1990)

It was the associations between the facet specific, school, demographic, personal and overall job satisfaction components of the above model that is of interest to this thesis.

The Teacher Professional Study has demonstrated that cultural differences are evident in reports of overall job satisfaction (the USA showing the highest and Japan and England the lowest and second lowest respectively) (Menlo & Poppleton, 1990; Ninomiya & Okato, 1990; Poppleton & Riseborough, 1990a). Different job components are found to vary in importance with high material rewards being most valued in West Germany, structured in-service opportunities in Japan; a broad job scope in England and a close teacher/pupil relationships in the USA, for example. There are inter-cultural similarities, all teachers being unhappy with their professional status as defined by the position or standing they perceived themselves to have in the community (Poppleton & Riseborough, 1990a; Poppleton, 1992).

Adapted versions of the TPS study instrument have been used in other countries. In Albania, it was found that job security, respect from the community, co-operation with

colleagues and items measuring professional autonomy were most related with overall job satisfaction. It was interesting to note in this research that although the conditions of work in Albanian schools are considered poor, teachers feel highly respected by their local communities and satisfaction with their work was higher than the countries studied in the original TPS study (Kloep & Tarifa, 1994).

In Poland, Wisniewski (1990) made use of some of the TPS instrument items to classify teachers into high, medium and low satisfied groups. It was found that teachers that were highly satisfied tended to have encountered good pay, good organisation of work in the school, a pleasant atmosphere and environment in the school and suitable conditions for experimenting on education and teaching.

Cross-country comparisons should be treated with some care due to the cultural differences in interpretation of similar survey questionnaires. Ninomiya & Okato (1990) warn, for example, of the lack of clarity and directness of expression with which Japanese teachers may respond to questions which, although similar at face value to the responses of other countries, may in fact represent very different sentiments. In addition, it should also be considered that satisfaction may have different meanings for different people, with alternative job satisfaction issues or components being relevant in differing cultures. It is also possible that similar components of job satisfaction are relevant but that these facets are valued to different degrees (Berry & Houston, 1993). Cross-country comparisons are still relevant, however, as they allow an insight into what pertains to teaching as a universal profession, on the one hand, and what is culturally bound, on the other (Menlo & Poppleton, 1990).

Not all models or perspectives on job satisfaction can be given justice in this review, and only those of direct application to the present research have been discussed. Many others models describing the nature and functioning of satisfaction exist, some similar to those described (e.g., Lawler's Facet Theory [Berry and Houston, 1993]; Mercer Model [Mercer, 1997]), others more novel in their approach (e.g., the Opponent Process Theory; Vitamin Model [Landy; 1989]). The Job Characteristics model (Hackman & Oldham, 1975; Barnabé & Burns, 1994) is another model, validated in the teaching context, but not of direct application to the present research.

2.10.6. Maslow's Needs Hierarchy

Maslow's Needs Hierarchy is not strictly speaking a satisfaction theory but one explaining motivation. It is included here as motivation and satisfaction are closely related and motivational theories exist that include the concept of satisfaction and, alternatively, some job satisfaction theories have developed from motivational frameworks (Berry & Houston, 1993). Work motivation and job satisfaction are separate constructs, however, motivation being a direct cause of behaviour whereas job satisfaction is not. The adequate provision of particular job components may fulfil important needs and satisfy people when achieved. It does not necessarily follow that workers are motivated to act in response to this satisfaction. Obtaining certain job characteristics may only motivate people if their behaviour is necessary in obtaining these characteristics (Miskel & Ogawa, 1988).

Maslow (1954) proposed that individuals have certain needs that require satisfaction or gratification, i.e. this, and similar theories, describe needs held by an individual, that when gratified, achieve satisfaction in this area. There are five categories of basic needs:

- Physiological needs, e.g. the need for food
- Safety needs, e.g., security, freedom from fear, anxiety and chaos, need for structure
- Belongingness and love needs, e.g. the giving and receiving of affection
- Esteem needs, e.g. need for a stable, usually high evaluation of oneself, self-respect and the desire for the esteem of others.
- Self-actualisation needs, e.g. the need for self-fulfilment, to actualise what you are potentially.

If physiological requirements are not met, the individual's behaviour will be motivated by the need to satisfy these. When a need is satisfied, it no longer is a motivator and those further up the hierarchy (i.e., safety needs) will begin to motivate behaviour. Self-actualisation needs are at the top of the hierarchy and the need to satisfy such desires will only become relevant if physiological, safety, love and esteem needs are already satisfied.

Although some believe that the need hierarchy theory has not been useful in explaining the experimental evidence produced (Campbell & Pritchard, 1976; Miskel & Ogawa, 1988), it remains popular in explaining motivation at work (Berry & Houston, 1993). Criticisms focus on the vagueness of definition of some of the higher need levels, self actualisation especially, as well as lack of methodological rigor (Miskel & Ogawa, 1988).

The theory has been applied in the educational context where teachers were found to lack in gratification of the needs of autonomy, self-actualisation and especially self-esteem (Porter, Trusty & Sergiovanni, 1966 as quoted by Miskel & Ogawa, 1988). These are findings in keeping with those in international studies on teacher job satisfaction (Poppleton & Riseborough; 1990a; Poppleton, 1992) where teachers were found to be unhappy with their professional status as defined by their position or standing they perceive themselves to have in the community.

Evans (1997) uses her distinction between job comfort and job fulfilment to link Maslow's theories of human motivation and Herzberg's two-factor model. She suggests that job comfort components, satisfiers in the two-factor theory, may describe lower order job related need fulfilment and that job fulfilment, associated with dissatisfiers, is related to higher order fulfilment needs.

The above review gives a few basic principles that underlie the research that will follow and some of the issues raised here will be returned to during discussions of the research findings. Having presented the theory behind the study it is necessary to give a brief discussion of the context in which the research has taken place, i.e., the educational system of Chile. This is the theme of the chapter that follows.

CHAPTER 3 CONTEXTUAL BACKGROUND - EDUCATION IN CHILE

The objective of this chapter is to give a brief consideration of the structure of the Chilean education system, focusing on secondary education and the Humanistico Cientifica type programme. Challenges that face Chilean education and more specifically the teachers within it, and their influence upon students, are highlighted.

3.1. Structure of secondary education

3.1.1. School administration

The majority of schools in Chile may fall under the administration of three alternative authorities:

- Municipal schools are run by the municipality and receive subsidies from the state, administered for them by this local authority. Students do not pay, or make minimum financial contributions to the school;
- Private subsidised schools fall under the authority of a private director or directors but still receive a subsidy from the state. These schools may be religious or lay in nature and students pay from a very small token contribution to a fairly substantial amount for their schooling;
- Private schools fall under the authority of private director or directors but receive no subsidy from the state. Again schools can be religious or lay in nature and fees are in the higher contributor bracket.

The number of each establishment found nation wide and the percentage of students enrolled per school are shown in Table 3.01.

Table 3.01: Numbers of schools by type of administration and associated student enrolment

School Type	Number of schools (%)	Number of Students (%)
Municipal	458 (33.3)	227744 (54.8)
Private subsidised	486 (35.3)	110140 (26.5)
Private fee paying	421 (30.6)	76089 (18.3)
Other	11 (0.8)	1946 (0.5)

*these figures were for Humanistico Cientifica. secondary education in both rural and urban areas. Adult education institutions are excluded (Ministerio de Educación Publica, 1996).

3.1.2. Curriculum

At the time of analysis, secondary education was dichotomous in nature, organised into either a more academic programme (*Educación Media Humanistico Cientifica-H.C.*) or a vocational curriculum (*Educación Media Tecnico Profesional-T.P.*). It is the H.C. programme with which this research is concerned.

Humanistico Cientifica education is divided into two cycles. The first cycle comprises years 13/14 and 14/15 and the second cycle years 15/16 and 16/17 (Table 3.02). In the first cycle, it is recommended that the Sciences, Maths and Spanish language subjects are equally weighted, with 5 hours to be distributed between Biology, Chemistry and Physics. In the second cycle, Science remains an obligatory subject, but electives across the subjects means that students at this level, study Science to greater or lesser extents, depending upon their interest (Nieda & Cañas, 1992).

Table 3.02: Structure of secondary education

AGES (years)	13-14	14-15	15-16	16-17
COURSE	1°	2°	3°	4°
CYCLE	first cycle		Second cycle	

(Nieda & Cañas, 1992)

The year is divided into 2 semesters although some schools implement a 3 semester system. In municipal schools at present, the average school day is 5 hours and teachers may sometimes work 2 or 3 shifts daily. Beginning in 1997 procedures have been underway to extend the school day by 3 hours bringing the number of school hours more in line with those of industrialised countries (Angell, 1997). This was in various stages of implementation in the schools of this study.

Subject curricula are outlined, (Decree 300) but there is an emphasis on the flexibility of the educational system and its adaptability to the needs of the students and the institutional environment and context. Some institutions, for example, are authorised to implement programmes where up to 30% of the weekly timetable in the first cycle may be allocated to subjects and practices that are directed towards the workplace. This directive is particularly aimed at rural and semi-urban schools and would seem to foster a system where a number of pupils would leave school at this stage (Nieda & Cañas, 1992). This flexibility should be remembered when teachers are found to deliver reduced forms of the curriculum to students of lower socio-economic status as discussed in later Chapters (Gysling, 1992b).

Guidance on advisable teaching methods to be employed are very generalised with few, if any concrete directives (Nieda & Cañas, 1992). The course content is a broad one and the autonomy of the teacher in the planning, organisation and development of the educational process is stressed as is the autonomy of the teacher/institution in the selection and implementation of teaching strategies that will most suit the context of the school. There is some doubt, however, as to the extent these recommendations are, or can be, practised by teachers within the classrooms (Asenjo Pérez *et al.*, 1991).

The relevance of the curriculum is seen as an issue of importance. General education received by students has been criticised for not preparing them for the work place, society or their personal needs. At a secondary level, those leaving the school with the more academic *Humanistico Cientifica* education (which in 1990 was 64.5% of the secondary school population) are less likely to find employment than those who receive *Techno-Profesional* type education). The lesser percentage of students entering the latter type of education, as well as the lack of expansion and diversification of education at a post secondary level, means that the majority of students learn skills in professions for which the labour market is already saturated. Nor are students provided with skills in areas of new technology and careers in which there may be shortages. This, assisted by the expansion in the education system over the past 30 years, has resulted in a large number of economically active individuals whose employment aspirations are often disappointed (Asenjo Pérez *et al.*, 1991; Aedo-Richmond, 1995).

Programmes have also been criticised for not taking into account the divergent realities of distinct socio-economic sectors, differential language development being given as one example (Vera *et al.*, 1990).

The objectives of the science programme, specifically, are to contribute to the student's knowledge of herself and the environment, to elevate her quality of life, to imprint positive feelings to her existence and to contribute to the students' integration into society. Science is seen as a subject for all, and students are expected to gain an awareness of the contributions science has made to knowledge and an improvement in the quality of life in the world (Ugarte Iglesias *et al.*, 1997). Changes in the science curriculum have been attempted with a reduction in emphasis upon scientific academic knowledge and a move to incorporate contemporary issues of the environment, health

and technology (Insausti Tuñón & Oñorbe de Torre, 1997). The science curriculum content is organised in anticipation of students leaving at the end of the first cycle of secondary education, the Biology curriculum in the first cycle, for example, emphasising topics that will prepare students for the "real world" including human anatomy, physiology, ecology and health education (King, 1986).

A new curriculum, replacing Decree 300 and its modifications, is at present in the implementation stages.

3.2. Student evaluation

Few actual guidelines are given within the curriculum about how to evaluate (Nieda & Cañas, 1992) but certain procedures appear standard. Student evaluation is largely internal with grades ranging from 1.0 to 7.0 with a minimum pass level of 4.0. An end of year examination in the first and third year of secondary school is required in Maths and Spanish language although this may be avoided if the average of the student's grades is greater than 5.0.

Pupils who complete the four years of secondary education are granted the *Licencia de Educación Media* (or school-leaving certificate) (Asenjo Pérez *et al.*, 1991).

There is only one truly national examination held in the secondary level of schooling and this is the *Sistema de Medición de la Calidad de la Educación* (SIMCE) (system for measuring educational quality). These examinations test basic Maths and Spanish skills as well as evaluating students' self-esteem and attitude towards the education system and environment. The examination is distributed nationally to a limited school sample and at the secondary level is very much in its infancy (Asenjo Pérez *et al.*, 1991; Ministerio de Educación, 1992; Ministerio de Educación, 1994; Sagaris, 1995).

The SIMCE format is multiple choice (Sagaris, 1995) which raises questions as to the effectiveness of these tests as an assessment tool. Such test types have been criticised for encouraging rote learning and lower order cognitive skills, although their economic efficiency, avoidance of subjective scoring and classical psychometric standards of validity and reliability are in their favour (Walberg, 1991).

The co-ordinators of this examination have also been criticised for not presenting the achievement of the school as a whole in the examinations. Parents find it difficult, therefore, to select schools based on overall performance. Furthermore, the examinations give little indication of the value added dimension that a school provides and reflect well on schools that train students to pass the examination only, rather than providing a good all round learning experience (*Informe Brunner* as quoted by Angell, 1997). It is also not unheard of for students with lower achievement possibilities to be encouraged to stay at home on the day of the examination.

Forty percent of the students entering higher education go into universities. The *Licencia de Educación Media* is required for entry and a university entrance examination, *La Prueba de Aptitud Academica* (P.A.A)(test of academic ability) must be passed. The grade obtained in the P.A.A. examination, along with a general average of grades obtained in the 4 years of secondary school, are amalgamated when entrance into the universities is considered (British Council, 1977; Asenjo Pérez *et al.*, 1991).

3.3. Teacher training

Teacher training can be acquired both at universities or professional institutions. Pre and primary school teachers follow a three year degree course and secondary school teachers are expected to follow a 5 year degree course with a speciality subject. Teachers who wish to practice in secondary schools must possess a teaching qualification from a Chilean University or Institution or if they are not qualified, have ten years teaching experience and have been registered with the *Colegio de Profesores* (the main teachers union) in 1974 (British council, 1977; Asenjo Pérez *et al.*, 1991; Insausti Tuñón & Oñorbe de Torre, 1997).

In-service training is still an informal procedure although recent policy (Ministerio de Educación, 1991) aims to change this. In-service training is often performed through universities although other institutions may also be involved (e.g., *Centro de Perfeccionamiento para experimentación y investigación* -CPEIP). Distance learning packages are also available (Soto Rodriguez; 1987; Gysling, 1994, Insausti Tuñón & Oñorbe de Torre, 1997).

Science subject teacher associations are in existence but are not as large or as active as those in other parts of the world such as the United Kingdom (Insausti Tuñón & Oñorbe de Torre, 1997).

3.4. General Challenges facing the Chilean Educational System

The aims of the post Pinochet governments of Aylwin (1990-1994) and Frei (1994-2000) were listed as the maintenance of the free market economy encouraged under military rule, the support of economic growth and an increase in international competitiveness. This was to be achieved in conjunction with a reduction in social inequalities and poverty exacerbated under the previous regime. The modernisation and improvement of the efficiency of the educational system is quoted as being one possible way of achieving this (Avalos, 1996a).

Some success has been achieved with the above objectives, with figures of the percentage poor (reduced to 32.7% in 1992 from 44.4% in 1987), the unemployed (4.5% in 1993 compared with 6.5 % in 1990 and 20% in 1982) and inflation (decreased to 12% at the end of 1993) showing decreases simultaneous to rapid economic growth (10.3% in 1992 and 6.2% in 1993), increased minimum wages (increased by 30% in real terms since 1990) and the highest investment rate in Latin America (estimated at 27.5% of the gross national product) (Fidler & Pilling, 1993; Pilling, 1993). Despite these successes outside of the educational arena, the educational system continues to face various challenges, some of which will now be discussed.

3.4.1. The equal distribution of quality education

3.4.1.1.Administration

The minimisation of differences observed in the quality of education received by distinct population groups is one of the priority assignments of the education ministry. The most prominent issue lies in the inequalities that present themselves between the schools of the different administration types.

An analysis of SIMCE national examination results (Ministerio de Educación, 1994; Sagaris, 1995) has shown that there is a relationship between low achievement and whether the student is from a municipal school or a private school (Table 3.03), the best results being obtained in the private fee-paying establishments, the worst in the municipal sector. Differences also occur in the measurement of appropriate learning

strategies that students perceive themselves to use although differences are not as great (Table 3.03).

Table 3.03: Secondary Humanistico Cientifica (H.C.) school average scores in Spanish language and Mathematics per administration type

	Administration type	*Municipal*	*Private subsidised*	*Private fee-paying*
Subject				
Spanish language (%)		57.97	66.49	75.51
Mathematics (%)		42.97	51.68	67.90
Appropriate learning strategies (%)		65.67	66.92	67.90

(Ministerio de Educación, 1994)

Inequality in student achievement outcomes between administrative sectors has also been noted in independent studies, where showing private schools to score better on tests measuring advancement of learning strategies, reading comprehension and logical intelligence. Moreover, discrepancies in affective measures were found, private subsidised schools demonstrating higher levels of self-esteem than their municipal peers (Segure *et al.*, 1993).

The SIMCE examination also measures more affective student outcomes such as self-esteem although, unlike Segure *et al.* (1993), differences surprisingly appear in favour of the municipal administrations (Table 3.04). Differences are smaller than those noted for achievement but, as with achievement figures, no indication of the significance of differences is given. Attitudes towards the environment were also measured and similar observations to that made for self-esteem can be made (Ministerio de Educación, 1994).

Table 3.04: Secondary Humanistico Cientifica (H.C.) school average scores in the affective elements of self-esteem, and attitude to the environment per administration

	Administration Type	*Municipal*	*Private subsidised*	*Private fee-paying*
Subject				
Self esteem (%)		50.62	49.40	47.93
Attitude to the environment (%)		50.86	49.48	49.07

(Ministerio de Educación, 1994)

A further indication of how the different school administrations differ, may be seen in scales, located within the SIMCE programme, that evaluated the opinions of pupils, teachers and parents on their roles, tasks and responsibilities within the educational system. Examples of these scales and the responses made by the three educational sectors can be observed in Table 3.05.

When students were measured on each of the 4 scales (Table 3.05), private subsidised schools demonstrated higher scores indicating that, although the statistical significance of results has not been demonstrated, the school climate, as perceived by the pupil, is best in these establishments. On the other hand, when teacher perceptions are measured, the better scores are assigned to the climate in the private fee paying sector. There is consistency, however, in the lower ratings of municipal schools as assessed by both teachers and pupils in these institutions. Where parents responded to scales, those from private subsidised schools agree with their children in giving the highest ratings to teacher efficiency and their own satisfaction with the education provided by the institution. In the final scale looking at the interaction between teachers, pupils and teachers, relationships are scored highest in private fee-paying organisations.

Table 3.05: Secondary Humanistico Cientifica (H.C.) school average scores of pupils, teachers and parents in the affective elements of teacher efficiency, satisfaction and identity with school and teacher interest in pupil

	Administration type	*Municipal*	*Private subsidised*	*Private fee-paying*
Subject				
Perception of grade of efficiency of teacher in interactions with parents, teaching and evaluation of students (%).	Pupil	63.83	64.48	63.63
	Teacher	70.08	74.89	76.87
	Parent	74.09	76.65	74.59
Perception of own degree of satisfaction and identification with the school (%).	Pupil	71.09	71.87	69.91
	Teacher	68.55	75.03	77.32
	Parent	79.96	93.17	80.56
Perception of the interaction between teachers, parents and pupils and the instances of mutual support (%).	Pupil	65.46	68.04	67.89
	Teacher	66.59	73.66	75.58
	Parent	78.92	82.07	83.74
Perception of the interest teacher shows towards the teaching and learning of the pupil (%).	Pupil	70.75	71.36	67.94
	Teacher	66.30	70.89	73.92

(Ministerio de Educación, 1994)

Several differences between schools of alternate administration type may explain some of the disparity in educational outputs observed. A strong association between the different forms of government and the socio-economic status of enrolled students, for example, has been demonstrated, the municipal school attracting lesser privileged individuals (Himmel Koning *et al.*, 1993). The divide between municipal and private (especially private fee-paying) schools is further emphasised through selection procedures that private schools are able to employ based upon both the academic and behavioural records of the student. In the private subsidised sector, this selection procedure is in conflict, however, with the pressure to increase pupil numbers upon

which government subsidies are granted. Class numbers in the municipal and private subsidised schools are, therefore, often comparable. School subsidies face further criticism based on their administration through the municipality with allegations of some municipalities using money directed at education to pay off other financial deficits (Vasquez Ordenes, 1996). Furthermore, the amount spent on students in state funded schools is far lower than that spent on private students, deficits likely to affect the quality and quantity of resources, physical working conditions and teacher salaries (Avalos, 1996a)

Inequality of outcome between schools is alleged to have been emphasised by the decentralisation educational policy implemented by the Pinochet government. Under such policy, responsibility for the administration of state schools was transferred from the ministry to the municipality. Curricular and administrative flexibility ostensibly aimed at improving the contextual relevance of education and making administration more efficient, was encouraged. It has been argued that in practice this leads to the minimisation of the curriculum in poorer schools causing them to flounder with few resources, unable to achieve or benefit from the policy as wealthier institutions may have done. Policies of decentralisation have been further blamed for reducing teacher salaries, working conditions and morale and increasing educational inequalities (Cox, 1990; Flip, 1993; Guttman, 1993; Aedo-Richmond & Richmond, 1996).

Different school administrations may follow alternative lines to maximise achievement, teachers in municipal schools feeling strong student discipline is the key whereas in private free paying institutions tight control over teacher action is seen as paramount. The private subsidised sector seemed to favour a combination of both these strategies (Gysling, 1992b).

Teacher practices vary from one institution to another, which may contribute to an explanation of the inequities in the distribution of quality education. Gysling (1992b), for example, found that teachers felt that lower socio-economic status schools often lacked a set educational project with teachers being content with doing what they saw was possible. Edwards *et al.*, (1993) also makes this comment on lack of educational project, further describing municipal schools as being typically bureaucratic in their practices. Private schools, however, have been criticised as neglecting the education of

basic values placing emphasis on instructional activity alone. One teacher in Gysling's study makes an illustrative quote:

> "The private subsidised school is more stressful (than the municipal school in which she also worked) with very unhappy teachers who deliver less values to their students also. They teach more but deliver fewer values. Perhaps it is because people are afraid to criticise and afraid to instil democratic values"(Gysling, 1992b; p73).

Differences between teacher performance in the different sectors in terms of subject content knowledge, professional creativity and autonomy has been reported, teachers in private, *Humanistico Cientifica* (H.C.) type institutions scoring best, the worst performances being observed in teachers in the municipal, *Tecnico Profesional* type organisations (Pascual Kelly, 1995).

Teacher may inadvertently play a role in the reproduction of social inequalities as shown in research aimed at eliciting teacher opinion on student characteristics that favoured achievement, expectations of the pupil and the background of the student. The majority of teachers emphasised student backgrounds (e.g., their social problems or poverty) as associated with achievement, leading to the conclusion that teachers, through their beliefs, may help reinforce the perception that poverty is linked with low achievement (Flip *et al.*, 1983).

Gysling (1992b) would not completely favour this statement as shown by her comparison of teacher treatment of the Biology and Spanish language curriculum with students of low and higher socio-economic status. Although teachers were likely to instruct the two groups differently in terms of the curriculum content, depth and length of programme, they did so because of the social problems and the lack of motivation that students from the poorer sectors present, rather than because of a preconceived bias towards them. Motivation is seen as specifically wanting in students of lower socio-economic status attending the H.C. type education as the only progression possible from such academic style education is university. Low socio-economic status students may have little possibility of going to university either because of financial considerations or alternative work plans held by their parents and motivation to achieve at school,

therefore, cannot be very high. The study orientation of the family was also suggested as a factor in student motivation (Gysling, 1992b).

The link between motivation and socio-economic status was not always clear cut as reports of indolent and unmotivated students in the most affluent of the private fee paying schools was also observed. It is thus proposed that this might be related to the greater opportunity of a place in university based on these students also being able to afford entrance into private universities. A balance seems to be achieved between student motivation and associated achievement in the middle socio-economic status students where scholastic achievement is viewed as a means of social advancement (Gysling, 1992b).

The possibility of entrance into university is a factor considered by teachers as well as students. In schools where university was seen by teachers as a possibility in the students' future, the whole curriculum is generally attempted although the programme might only be superficially covered, depending on the motivation and behaviour of students. In schools where progression to university was seen as virtually impossible, drastic changes to the content may be made, an action also cogent with student behaviour. In Biology for example, units of reproduction and health would be focused on at the cost of other topics (Gysling, 1992b).

Further inequality between different schools is demonstrated by the disproportionate number of private school students entering universities. This situation has been worsened by the decline in subsidies to the universities and a decrease in financial assistance to students studying there (Asenjo Pérez *et al.*, 1991). Students from state and private subsidised schools, being from poorer backgrounds, are more likely to require such assistance and, hence, be discriminated against by these reductions.

From the above discussion it would certainly seem that students attending municipal schools receive the lowest quality of education. Those in the private fee-paying and better resourced sectors appear to receive the best. A further division may be made within private schools between those owned by the church and those owned by secular authorities, religious establishments viewed as more effective, demonstrating high levels of institutionalisation and as more effective at obtaining their objectives (Edwards *et al.*, 1993). This echoes findings in other countries, the US for example, where

religious schools, perhaps due to increased social cohesion in the school community, provide higher quality education (Coleman, 1997).

Disparities in achievement also exist between results obtained from urban and rural areas, higher scores being observed in urban H.C. establishments (Table 3.06).

Table 3.06: Secondary Humanistico Cientifica (H.C.) school average scores in Spanish language and Mathematics per location

	Location of school	***Urban***	***Rural***
Subject			
Spanish language (%)		64.61	57.43
Mathematics (%)		51.27	44.37

(Ministerio de Educación, 1994)

Regional differences are also found (Asenjo Pérez *et al.*, 1991) with regions VI, VII, IX and X (of the 12 designated regions in Chile) where rural enrolment is high, being of particular concern, (Rodríguez, 1994). Particularly poor results have been noted in region IX where there is a high concentration of Mapuche Indian students. As language difficulties may contribute to these low attainments, an inquiry into the bilingual variable of the SIMCE examination has been suggested (Sagaris, 1995).

3.4.1.2.Gender

Educational opportunity by gender is traditionally an equitable one in Chile, with female enrolments being marginally inferior in primary education but slightly superior in secondary education. The least equitable distribution appears to be at the tertiary level (Rodriquez, 1994). Although opportunities at the secondary level may be on a par, it is suggested that the high school is still an agent guilty of the transmission of sexual stereotypes (Micheli & Edwards; 1995). This was concluded after observation that, although girls played an active role in class, this participation was often ignored with recognition being given only to interventions made by male students. Although few studies were uncovered that looked at the relationship between gender and achievement in Chile, the negative findings that might have been expected were not immediately evident, Muñoz Arias *et al.* (1994), for example, showing female students actually to be achieving better.

3.4.1.3.Development of science and technology

Chilean education faces the challenge of improving scientific and technological development nationally. Lack of definite policy towards science development and the need for modernisation of the science curriculum is particularly noted. This is of concern considering the alleged importance of science in social and economic development (Lewin, 1993).

The scientific educational programme has been criticised as disjointed and lacking integration (Orellana Bernado & Rosas Diaz, 1993) and high numbers of students enter university with a lack of adequate preparation, holding a series of distorted scientific concepts (Ogalde Hoyos, 1996).

Previously transport and communication difficulties with all the regions of Chile may have made the dissemination and incorporation of adequate scientific cultural content into the plans and programmes of secondary education more difficult. This situation has improved, assisted by the development of a commission (CONICYT) in the mid to late sixties with the objective of developing science and technology nationally. Insufficient funding, bureaucracy and little interest have inhibited its progress. Resistance is also encountered based on the underlying feeling that the position of a scientific culture within reality is superfluous (Von Shackman *et al.*, 1992).

Other projects are in existence that have the objective of improving science education through the improvement of the training received by science teachers themselves. One such programme, *Red Gacela*, aims with the co-operation of some Latin American and European universities to develop science teaching in the region, adapting to the individual needs of science teachers in the different participating countries (Sanchez Jimenez, 1997). Science teachers will be heavily involved in this procedure. The programme hopes to consolidate groups of university teachers specialised in science teaching, aims to propose models for the modernisation of teacher pre and in-service education and seeks to form and connect groups of science teachers to create and interchange knowledge and experience. Indications of how this programme has progressed has been the running of a masters programme in science teaching and the holding of an Ibero-american conference on this subject in Chile in July 1998.

3.4.1.4.Inadequate teacher training

The quality of teacher training has been criticised with poor preparation being given for the use of new teaching methods and weak links being forged between subject content and these methods. There are shortages of qualified Physics and Mathematics teachers, professions which, considering the poor working conditions and salaries received, are unlikely to attract interested and good quality scientists (Avalos, 1996a).

3.4.1.5.Teaching methods

Across Latin America the quantitative (e.g. expansion of educational system through increased enrolment) and qualitative (e.g. the greater number of students from lower socio-economic status groups) changes in the educational systems have been noted. Systems are criticised, despite these changes, for retaining traditional organisation, administration, teacher training, curriculum styles and teaching methods that favour the higher socio-economic status students and are inadequate for those at lower strata (Ezpeleta, 1989; Schiefelbein *et al.,* 1994). Teaching practice is seen as relying heavily on rigid teaching methods, usually dictation, often forced on teachers due to lack of resources (Avalos, 1996b).

3.4.1.6.Dropout and repetition

Dropout (permanent dropout was 7.4% in secondary schools in 1990) and repetition rates (12.4% in secondary education in 1990) (Rodriguez, 1994). remain a problem in the Chilean system.

3.5. Educational improvement

In the spirit of negotiation and reconciliation, improvement (rather than reform) of the educational system is the more accepted term for the educational strategies that have been designed and/or implemented within the last decade (Angell, 1997). There are several programmes that have been implemented in the 1990s with the interest of improvement in the Chilean educational system which include the Schools 900 programme and *MECE-Básica* aimed at primary education, *MECE-Rural* situated within rural education and *Enlaces*, also a MECE programme, related to the supply of schools with computers and establishment of inter-institutional computer networks. These programmes will not be dealt with in this review but objectives, achievements and critiques may be found in detail elsewhere (e.g. Flip, 1993, Guttman, 1993, Aedo-Richmond, 1995; Preston, 1995; Aedo-Richmond & Richmond, 1996; Angell, 1997).

3.5.1. MECE-Media programme

The *Programa de Mejoramiento de la Calidad y Equidad de la Educación* (MECE) (programme of improving the quality and equality of education), began in 1992 although the programme related to secondary education specifically was initiated only in 1995 and was planned to run for a 5 year period (Avalos, 1996a).

In her description of the improvements planned for secondary education, Avalos (1996a) summarises the reform proposals for both of the *MECE-Media* programme and the educational system as a whole. Some objectives particularly related to teacher working conditions were the following:

- It has been recognised that gaining the support of and contribution from teachers and developing their professional skills is essential to the achievement of several educational goals, some of which include the implementation of innovative and alternative teaching strategies. Teacher professional groups were formed that, through the guidance of supervisors or inspectors, hoped to encourage reflection on, and implementation of, new teaching techniques.
- Effective leadership and administration of schools were seen as important, and workshops and distance training for head teachers and other administrators were anticipated to improve their administrative abilities.
- Sufficient resources were to be supplied to schools to enhance the learning experiences of secondary school students. Funding was, therefore, expended on producing and providing textbooks as well as curriculum and assessment materials to secondary schools. Provision of libraries and new or improved infrastructure were made. The necessity of computer skills and communication in an era of modern science and technology was recognised and, hence, funding was to be allocated for computer and computer networking facilities.
- Schools were encouraged to develop so-called Educational Development Projects that may be of a general kind or focus on specific problems. Such projects received funding for a period of one and a half years from their inception, funding being granted on a competitive basis. These have been criticised by Avalos (1996a) as being designed to 'offend against broader human values of social cohesion', some contradiction existing, she argues, in the encouragement of communication between schools and teachers via networking on the one hand and encouragement of

competitiveness on the other. The unfairness of expecting schools to compete for funding when the poorer school will be less able to develop innovative programmes through lack of resources, has also been mentioned (Avalos, 1996a). Positive discrimination policy may alleviate the latter.

- A similar argument could be made against the teacher incentive schemes proposed whereby teachers would be rewarded based on the performance of the school. Further plans were created to improve teacher training in the universities by introducing a fund that rewarded innovative schemes for improved teacher training developed on a competitive basis.
- Increased base level salaries for teachers have been also renegotiated although dissatisfaction is still reported.

At a general educational level, not specifically within the *MECE-Media* programme, the following additional improvements had been recommended:

- Funding to education was to be increased with a substantial amount of this aimed at increases in the subsidies received by state funded schools. Continuation with the granting of school subsidies based on student enrolment is criticised for directing teachers' interests more at keeping children in school rather than their actual learning experience and at encouraging overfilling of schools (Avalos, 1996a).
- Planned institutional, curriculum and assessment support promised to assist in the sustainability of the programme. Professional development support was also envisaged through co-operation between universities and other academic institutions (Avalos, 1996a).

The influence of the *MECE Media* programme on teachers' working lives and job satisfaction will be of interest. The programme is only recently reaching its termination stages, however, and a full evaluation of what has been achieved in relation to the above objectives is still premature.

3.5.2. Estatuto Docente teacher professional reform

Problems of teacher working conditions, rights and practice have been addressed specifically through the *Estatuto de Profesionales de Educación* (Statue of professionals in education-Law 19070) (Ministerio de Educación, 1991). This document aimed at

improving conditions such as salary and introducing protective legislation leading to greater job security. Improved opportunities for a professional career ladder and proposals to enhance teacher professionalism though increased autonomy, responsibility and participation were also made (Aedo-Richmond & Richmond, 1996).

The Estatuto Docente is seen as positive by the main teachers' union (Colegio de Profesores de Chile, 1997b) in that the rights, duties and obligations of educational professionals have been laid down and that there is an emphasis upon teacher autonomy in the materials and techniques of teaching that they use. Furthermore, there is some recognition of the administration functions inherent in teaching work (e.g., the planning and evaluation that is necessary in addition to the actual classroom practice). An ordering of salary structure at a national level and a basic minimum national wage are further points in its favour.

The union considers the document not to have resolved, however, the effects of decentralisation, municipalisation and wide spread privatisation of education especially the discrimination that exists between teachers working in the municipal sectors and private sectors where wide gaps exist in salary and working conditions. Nor do they feel it has fully addressed large class numbers, the work hours required for all the aspects of teaching, the lack of a true career path or the inadequacy of legislature that protects teachers as workers.

As the teacher and his influence upon student outcome is the focus of the present study, the effect of the teacher and the conditions under which he works, which the E*statuto Docente* has attempted to address, will now be considered in greater detail.

3.6. The influence of the Chilean teacher upon the student

The influence of the teacher upon student outcomes has been addressed in a general fashion in the previous chapter. It is feasible that many of the issues are also relevant in the Chilean context but that some effects are particular to the area. For this reason, studies drawn from the Chilean literature on the influence of teachers upon students, are reviewed.

Research outside of the Chilean context showed that teacher attitudes and behaviours may have an influence upon student attitudes and achievement (Sections 2.4.1.2 and

2.5.1.2, Chapter 2). Similar observations within the Chilean educational system were, therefore, not surprising, descriptions being made of classes where the actions of the teacher, often related to a concentration upon discipline, has led to the isolation of the student from the teacher and student apathy towards the subject (Lopez Espinosa, 1984). Furthermore, teachers found to be domineering, irritable, unhappy, rigid, impersonal, formal or impatient were observed to generate a prevailing class climate tense, unhappy and competitive in nature with low levels of communication. Pupils behaved in formal and passive fashions, responding only when required, with fear or submission. In contrast, when teachers were active, happy, flexible, calm, personal, enthusiastic, motivated and made efforts to stimulate thought and action in their students, a relaxed, happy, stimulating climate was created, with good communication between teacher and pupil and low discipline problems. Amongst the pupils themselves demonstrations of collegiality, co-operation between students, active participation, initiative, flexibility, security in self, expressiveness, creativity and enthusiasm for learning were demonstratred (Arancibia, 1986).

The influence of teachers was not limited to students' more social classroom behaviours. Although little literature exists nationally on science achievement specifically, associations with achievement in general are located. Teachers more in touch with their own feelings and needs, for example, who had higher expectations of the student and attributed lack of success to their own performance (rather than the characteristics of the child and family background) were associated with higher student achievement in reading and writing scores across the first year of primary education (Flip *et al.*, 1983).

Teachers, approached directly, as how they and the school might influence low student achievement, were shown to concentrate on factors affecting the *teaching* process (processes aimed at facilitating student learning) in their responses, making no mention of the transformations and operations that occur within the student as a function of the *learning* process. It was further noted that teachers view themselves very much in a technical rather than professional role and undervalue their own individual experiences as a source of understanding referring little to their own specific institutional or classroom contexts (Vera *et al.*, 1990).

Teachers place some blame for poor achievement at their own door, or at least that belonging to their colleagues, apportioning fault to a lack of duty and psychological problems whilst feeling other teachers held stereotypes, especially concerning the socio-economic status of students (Vera *et al.,* 1990). Such stereotypes are related to teacher expectations, suggested to be influential in student achievement (Pizarro Ruiz, 1986; Arancibia & Maltes, 1989). Affective student outcomes of academic self-concept are likewise affected by teachers' expectations. No relationship exist, however, between students' own academic self-concept and their actual achievement, which implies that a student's self perceptions are much dependent on the image the teacher has of the pupil (Arancibia & Maltes, 1989). If students take such store in what the teacher thinks of them personally, it is conceivable that they will place similar importance on what the teacher thinks of the school and system around them.

Diminished self esteem in teachers themselves, as seen in the Chilean situation, is also likely to produce conditions in which the self esteem and achievement of the student is affected. Such low esteem of the teacher, contributed to by the teachers' poor economic and contractual situation and lack of involvement in decision-making processes, is thought to have an effect upon institutional climate and communication. It was proposed that teachers with low self-esteem may emphasise authority and find it harder to befriend students because of a fear that they will lose this (Collarte Rivacoba & Arzola Medina, 1990). The latter authors may well be correct if the high use of discipline is still an issue in Chilean classrooms today.

The relationship between teacher expectation and student outcomes is not uncomplicated as an interaction with student socio-economic status would show. Low socio-economic status students were influenced by teacher academic expectations and teacher gender whereas higher socio-economic status students were not, affected instead by teacher's self-concept and years of experience. This finding led Arancibia & Maltes (1989) to conclude, in accordance with what was believed by teachers themselves (Vera *et al.,* 1990), that it is not the actual socio-economic status of the pupil that affects achievement but the nature of the beliefs and expectations of the teacher linked with that status (Arancibia & Maltes, 1989).

Teachers blame large class numbers for poor achievement as this prevents the teacher from giving attention to the individual pupil. Time was also seen as wasted in

administration procedures causing a reduction in valuable student-teacher classroom time. Lack of materials was also mentioned. Teacher workload, associated with mental and physical exhaustion and economic worries, brought into the classroom, were linked with weaker teacher motivation and performance and, hence, students low achievement (Vera *et al.*, 1990).

In-service and pre-service training of the teacher were thought to be in some way to blame for student performance with pre-service training being criticised as inferior in quality, attracting only students of low achievement. Training was viewed as inadequate in preparing new teachers for the reality of the classroom and failing to foster the ability to develop the affective dimension of the relationship with the student (Vera *et al.* 1990). Teachers themselves although perceiving certain aspects of training such as the coverage of subject content and pedagogic methods to be adequate, see the lack of emphasis on the ability to give pastoral guidance and the exercise of professional creativity as restrictive to their performance (Pascual & Navarro, 1992). The amount of in-service training was also seen as infrequent (Vera *et al.*, 1990).

A comparison of teachers' reports on factors that influence their own performance showed initial training to be more important than work and institutional conditions. This is especially marked in H.C. type schools. It also was noted that the manner in which teachers rate their own performance is more favourable than that provided by external evaluators, a discrepancy that can be explained several ways. Firstly, the nature of the evaluation procedure may be threatening to the teachers in such a way that they are inhibited from declaring the weakness they might perceive in their own performance. This might equally apply in the research discussed in this thesis when teachers are asked to describe what procedures they do or do not apply in their working lives. The second reason is associated with the lack of pedagogical support available to teachers that prevents them from recognising and improving on their teaching behaviours. They may not be able to see clearly the demands of professionalism made upon them and cannot assess their performance, being unclear as to standards of professionalism required of them. Weaknesses in initial teacher training do not provide teachers with the reflexive and critical skills required to assess their own professional activity adequately (Pascual & Navarro, 1992; Pascual Kelly, 1995).

A Chilean based model relating teacher variables to student outcomes (Figure 3.01) is worth reproducing here as it presents a useful location in which job satisfaction, as another indicator of teacher influence, may be placed in relation to the numerous other factors affecting student outcomes (Arancibia & Alvarez, 1994). In agreement with Perry *et al.* (1995) in his study in Botswana schools (Section 2.9.3; Chapter 2), the effect of teacher satisfaction is seen as indirect. It is interesting to note, however, in favour of the importance of teacher job satisfaction, that the point of entrance of working conditions into the model is through the porthole of teacher job satisfaction.

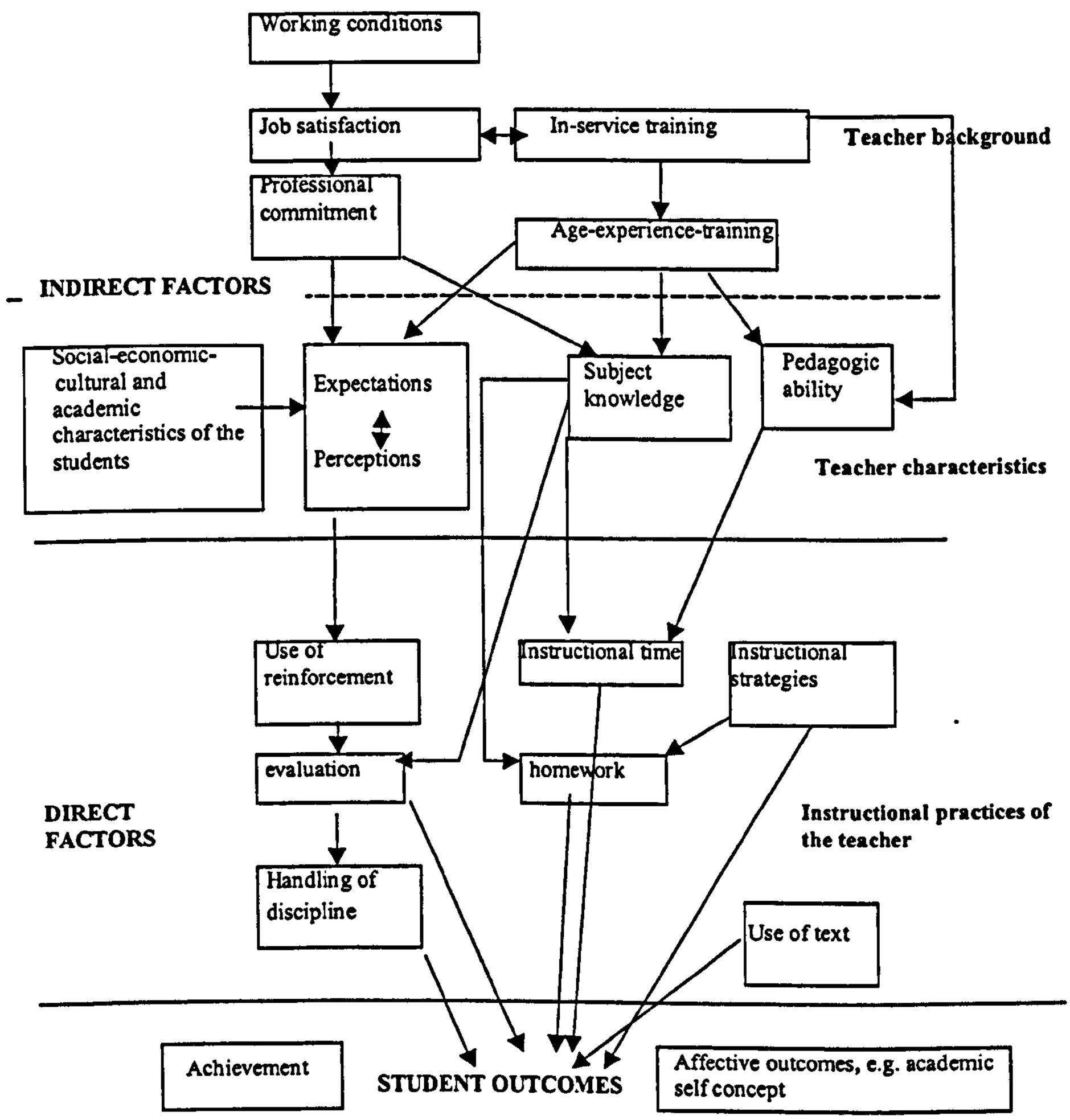


Figure 3.01: Model locating job satisfaction in relation to other teacher variables (Arancibia & Alvarez, 1994).

Indirect factors (Figure 3.01) included teacher characteristics and background variables such as certain components of job satisfaction, professional commitment and expectations of student achievement whereas direct factors were related specifically to

those behaviours that the teacher performed in the classroom such as the use of reinforcement and instructional strategies (Arancibia & Alvarez, 1994).

With respect to what teacher variables were associated with student achievement, teachers' evaluations of the working conditions were influential along side their contentment with work hours and their perceptions of the adequacy and sufficiency of materials. Whether teachers took responsibility for their students' success or failure was also of influence. The behaviours of using power effectively by being able to set students to work, the reinforcement of positive behaviours and setting students special responsibilities, were the direct teacher factors of significance (Arancibia & Alvarez, 1994).

Academic self-concept was also targeted as one student outcome in the above research, in addition to achievement. Directly, the teaching practices of reinforcement of positive student behaviours (a positive correlation) and disapproval of poor personal presentation (a negative correlation) were the variables of most importance to this outcome. Attributing success or failure to the family background of the student, in agreement with other research (Flip *et al.*, 1983), teacher verbal and spatial creativity and expectations of good student achievement were teacher characteristics that stood out amongst those studied. Most importantly for the present thesis, were relationships detected between student academic self concept and the evaluation by teachers of their working hours, salary and shifts, the socio-economic status of the school, their working contract, timetable and the amount of professional stimulation (Arancibia & Alvarez, 1994).

3.7. Teacher working conditions

In common with teachers in many countries in Latin America (e.g., Argentina: Ezpeleta, 1989; Peru: Tovar *et al.*, 1989; Bolivia: Subirats & Nogales, 1989; Mexico: Pasner, 1995; Latin America: Schiefelbein *et al.*, 1994; *A*valos, 1996b), Chilean teachers face several challenges in the work place that would seem likely to induce dissatisfaction (e.g., Delano *et al.*, 1991; Editorial, 1993; Cornejo & Rodriguez, 1997).

Gysling (1992a), writing about Chilean teachers, suggests that there is a need to professionalise teachers, to reposition them within society and to transform their teaching practices. She believes that such professionalisation cannot take place in a

vacuum and that it must be considered within the context in which it would take place, i.e. the context of the particular institution and even the context of the classroom. She argues that until now there has been a trend to isolate the working conditions and salaries of teachers from the quality of education but that there is a present need to professionalise teacher activity through observation of administrative and labour conditions and pedagogic organisation within the institution. This is in contrast to an emphasis at present placed on the technical aspect imparted through in-service and pre-service training.

Much of the complaints revolving around the poor working conditions that form the teaching context are seen as the legacy of the Pinochet era whose educational policies have been associated with the fragmentation of the teaching body, a phenomenon linked to deprofessionalisation, reduction in status and a deterioration in working conditions (Aedo-Richmond & Richmond, 1996; Avalos, 1996a; Colegio de Profesores de Chile; 1997a; 1997b). Although this is undoubtedly true, it would be difficult to maintain that teaching was in any way a lucrative profession in Chile prior to this era (Aravena Bolivar, 1994).

Several issues are pertinent to the present state of the teaching profession in Chile and some of the most commonly quoted themes are listed below:

- **Poor salaries:** Poor salary is a common issue in the teaching profession (e.g., Errázuriz *et al.,* 1994; Condemarin Grinberg, 1996). Moreover, it is common practice that salaries are contractual with teachers being paid on an hourly basis. This has been severely criticised as limiting teacher professionalism and commitment to the educational programme of the school (Gysling, 1992a). Retirement packages are also seen as inadequate (Colegio de Profesores de Chile, 1997a; 1997b).

- **Workload:** Teachers are viewed as having an unacceptable workload (Lopez *et al.,* 1984; Errázuriz *et al.,* 1994; Condemarin Grinberg, 1996; Insausti Tuñón & Oñorbe de Torre, 1997). Suggestions have been made to increase the time available to the teacher both in actual class-time to teach the subject adequately as well as out of class-time available for preparation and evaluation, (Gysling, 1994), time that should receive some form of remuneration (Colegio de Profesores de Chile, 1997a;

1997b). Limitation of official working hours also has been suggested (Colegio de Profesores de Chile, 1997a; 1997b) as has a decrease in class size, large numbers being associated with extra preparation as well as worsened student behaviour (Pereda; 1993; Colegio de Profesores de Chile, 1997a; 1997b). Teachers also see large class sizes, encouraged in the private subsidised and municipal sectors, as interfering with their teaching due to the reduction in the possibility of giving attention to individual students (Lopez *et al.*, 1984). Teachers are reported to work at times in more than one institution or even outside of the profession to supplement their income. This adds to their general workload.

- **Materials, resources and infrastructure:** Commentary has been made on the lack of materials and the absence of laboratories or laboratories large enough or sufficiently stocked for the class sizes present (Lopez *et al.*, 1984; Errázuriz *et al.*, 1994; Insausti Tuñón & Oñorbe de Torre, 1997).

- **Job security:** Security within a teaching job was a factor particularly relevant during processes of decentralisation when teachers ceased to be employees of the state and fell under the jurisdiction of the municipality (Lopez *et al.*, 1984). Teachers in the private sector are less secure in their positions, being less protected by national legislature. Additionally, private institutions have been known to employ hire/rehire policies whereby teachers are ostensibly dismissed at the end of the school year to be rehired again at the beginning of the next. This of course saves the school money in salary expenses but indicates again the lack of protection and security for teachers in these sectors.

- **Quality of pre-service training:** Teacher training has been criticised as having declined in quality, ill preparing teachers psychologically, technologically and pedagogically to enter the reality of teaching life (Errázuriz *et al.*, 1994). In Chile the quality of training is often a function of the different training organisations where quality may vary widely from one institution to another (Pascual & Navarro, 1992).

- **Lack of in-service training:** In-service training opportunities are not only inadequate but the quality, time available to attend such courses and the subsidy thereof are relevant issues. Teachers must often attend these courses at their own expense and in their own time (Errázuriz *et al.,* 1994; Insausti Tuñón & Oñorbe de Torre, 1997).

- **Reduction in autonomy:** A reduction in the autonomy of the teacher as experienced under military rule and the associated increase in supervision and control are other problems that need to be addressed (Colegio de Profesores de Chile, 1997a; 1997b)

- **Class disruption:** Teachers have complained of the interference of extracurricular activities during academic learning time (Lopez, *et al.,* 1984).

- **Reduction in status:** Teachers are thought of as lacking in social recognition for the important role they play in society (Gysling, 1992a; Condemarin Grinberg, 1996), a factor likely to cause diminished self-esteem and motivation (Gysling, 1992a) and a reduction in their capacity to stimulate the acquisition of knowledge, behavioural standards and ethical values in students (Errázuriz *et al.,* 1994). Reduction in status has been partially associated with changes that have been introduced in teacher training leading to a devaluation of teaching qualifications and a reduction in the quality of the persons encouraged to enter the profession. This is related to the wide spread belief that candidates, scoring least in the higher education entrance examinations, are only offered teaching as an area of future study (Gysling, 1992a; Errázuriz *et al.,* 1994). This is of particular concern when considering studies that show an association between teacher academic quality and student achievement to be an issue (Macias Carcamo, 1987).

- **Lack of clarity:** Inconsistent criteria in the allocation of benefits and promotion have been criticised (Profesores de Chile, 1997a; 1997b).

- **Organisational bureaucracy:** The school organisation is seen as overly hierarchical and bureaucratic with teachers having little say in school functioning or programme development (Lopez *et al.,* 1984; Colegio de Profesores de Chile, 1997a, 1997b).

- **Loss of vocation:** The deterioration of the teaching profession, attributed to the above conditions, is a cause of the reduction in the number of persons feeling a vocation to follow teaching as a career and a drop in the quality of students entering teacher training (Condemarin Grinberg; 1996). Additionally if a teacher has entered the profession with a sense of vocation, this is quickly destroyed by the working conditions she encounters. Municipal teachers were seen as those most unlikely to have or have retained their vocation and as the most frustrated (these teachers will be exposed to the lowest salaries and poorest working conditions). It is also felt generally that any efforts teachers have made to improve their professional conditions have been met with no success (Errázuriz *et al.,* 1994).

It should be remembered that many of the reports, from which the above descriptions have been drawn, were written in parallel to the present reform procedures that address these issues (e.g. Estatuto Docente, 1991; MECE Media, 1995-2000). It is felt, however, that teachers may remain dissatisfied despite these efforts, with salary at least, as a failure to regain the relative salary, living and professional conditions found in the pre-Pinochet period (Colegio de Profesores de Chile, 1997a; 1997b) and repeated and lengthy strike action over the last decade, usually salary-related, have shown (Aravena Bolivar, 1994; Psacharopoulos *et al.,* 1996; Vasquez; 1996). Furthermore, much of what was seen as constricting within the teaching profession a decade ago (Lopez *et al.,* 1984) is in line with many of the concerns still voiced today (Colegio de Profesores, 1997a; 1997b), a state of crisis recognised both within (e.g., Colegio de Profesores de Chile, 1997a; 1997b) and outside the teaching profession (e.g., Errázuriz *et al.,* 1994).

Not all educational commentators consider the teacher working conditions to be as serious as outlined and some in fact feel it to be somewhat exaggerated. Pascual Kelly (1995), for example, feels that the common rhetoric revolving around issues such as the lack of resources, long working hours, the need to work in several institutions or in several shifts and large class sizes, may not be entirely accurate in reality. In a study of

schools in Santiago, he found that 69.3% of his teacher sample worked in one school alone and 95% in two or less. With respect to excessive working hours, 54% worked between 30 and 44 hours a week, only 13.4 % more than 44, the remainder between 2 and 29 hours. These figures do not include unpaid work completed after school hours, however. Concerning class sizes, the author reports average class sizes of fewer than 30 unlike the critical levels of 40 and 45 sometimes reported. It should be remembered, however, that all three school administrations were used in the sample, including the more affluent private fee paying schools where class sizes are much lower than in the other sectors.

Pascual Kelly (1995) also demonstrated, in a review of the quality and quantity of equipment and didactic material available in schools, that the image presented of these conditions being inadequate was misleading particularly if schools at the extremes of the economic spectrum were removed. He feels that the problem with school resourcing is more to do with the accessibility and frequent use of these than a lack thereof. A general conclusion drawn, therefore, was that it is not so much the institutional and work conditions that need to changed in Chilean education but pedagogical management.

If the report of working conditions by Pascual Kelly (1995) on the one hand is compared to that made by the unions (Colegio de Profesores de Chile, 1997a; 1997b) on the other, a clear image of the reality of the teaching situation becomes difficult to formulate. For the purpose of this study, however, one is interested not so much in the reality of resourcing, class size etc, but this reality as teachers themselves perceive it.

Having considered the working conditions that face the Chilean teacher, consideration of their satisfaction with the situation is now appropriate.

3.8. Job satisfaction in Chilean teachers

Job satisfaction is a well-studied theme in the developed world (Section 2.6; Chapter 2) but there remains a need for the formation of job satisfaction theory in the teaching profession that is appropriate within developing countries (Garrett, 1999). The few local studies that have been published in this area make Chile no exception. Some of these studies are presented here with the objective of compiling a view of the job characteristics with which the Chilean teacher is most likely to be satisfied in her

profession and factors that have been shown to be most inhibitory to achieving this state. Unsurprisingly, the criticisms of working conditions, described in the previous section, are often reflected in the sources of satisfaction and dissatisfaction now listed.

3.8.1. Levels and sources of satisfaction

The sources and levels of satisfaction were shown to differ from one context to another within Chile but, in general, it appeared that sentiments were moderate and that some sources of satisfaction (e.g. interactions with others) and dissatisfaction (e.g., status and salary) were shared.

In Arica, in the North of Chile, for example, 80% of teachers in management positions and 52.1% of classroom teachers show professional dissatisfaction, a state largely related to the desire of the individual to make contact with others. No teachers were motivated by the desire for material possessions and most looked for the appreciation and affection of others (Alburquenque *et al.*, 1987).

A qualitative study of primary and secondary school teachers in the private subsidised sector showed teachers to be more generally satisfied, most content with their feelings of belonging to the establishment although this was again followed by the relationships held with others. These teachers were least satisfied with social recognition, salary and job security and tended to be better satisfied in religious rather than lay schools. Marital status and gender appeared to have little influence (Gutierrez Sanchez *et al.*, 1997).

Teachers in Chile, so as to meet economic demands, are known to hold down more than one employment position, either in another educational institution or in a job outside the teaching profession. Teachers who choose supplementary work, but restrict this to a job within the education field, are better satisfied with work itself and feelings of belonging scales. Teachers that have supplementary jobs outside of the profession display better satisfaction with their relationships with others (Gutierrez Sanchez *et al.*, 1997).

In a further Chilean study, 6 of every 10 teachers, when questioned about their choice of teaching as a career, expressed feelings of deception. Associated with these feelings are motives teachers present for either leaving or remaining in the profession. Work load, low salaries, student behaviour and the fact that a teacher experiences academic demands similar to those made in other professions, but with less compensation, are

primary reasons for withdrawal. Furthermore, older teachers feel that younger colleagues are leaving due to lack of a desire to comply with the rules of the establishment, resentment of privileges seen to be given to older members of staff, frustration with low student learning, lack of identification with the school and poor working conditions (Rodriguez Fuenzaliada, 1996).

When teachers were asked why they remained in the profession, new teachers mention a sense of vocation and older ones raise issues relating to fear of not finding alternative employment, the convenience of being able to work a half shift in relation to child care responsibilities and the pleasure they received from the colleagues with whom they worked (Rodriguez Fuenzaliada, 1996).

Other areas associated with teacher discontent include the under valuation of the profession, the frustration of working with pupils with few expectations, few decision making powers and the reduction of teacher authority by the ministry (Rodriguez Fuenzaliada, 1996). Lower class sizes were also associated with better work satisfaction being related with the ability of the teacher to give more individualised instruction and the reduction in pressures that originate from efforts to control larger classes. Teachers working only in one establishment were found to be more satisfied with their work (Diaz Hernandez, 1990).

It can be seen from the range of sources of satisfaction that the context of the teacher may have a considerable influence on the areas of the job reported to give satisfaction. Research specifically centred on special needs teachers, for example, has shown particularly low ratings in the job factors of work recognition, responsibility held, opportunities for personal growth and the content of work. Teachers of this type also appear dissatisfied with the availability of technical support, relationships formed, communication within the school, supervision, physical working conditions and their personal life as affected by their economic situation and job insecurity (Rojas Olavarria, 1995).

Delano *et al.* (1991) working with primary school teachers in municipal schools, on the other hand, finds teachers most satisfied with their training, the structures and norms of their job, working hours and the organisation. They share, with special needs teachers, a satisfaction with the content of their work and human relations and dissatisfaction

with job security. They also mention dissatisfaction with pay, additional benefits, work mobility and participation. No interactions were found between satisfaction and teacher characteristics of age, gender, marital status, family responsibilities, experience, training or whether they worked a double shift.

3.8.2. School administration

Differences in satisfaction may be related to the alternative school administration types (Rojas Olavarria, 1995). Significant differences were not detected but interestingly, reports from municipal and private fee paying schools were more like each other than they were to those from private subsidised sector schools. Private subsidised schools tended to present lower scores than those in the other sectors. Other research has demonstrated private fee paying teachers to be better satisfied with their work generally than teachers in private subsidised and municipal establishments. Similar patterns are observed in satisfaction with economic aspects, issues such as personal growth, status and work content and physical working conditions. The higher levels of satisfaction in the private sector are confirmed when one reviews average teacher perceptions of their own degree of satisfaction and identification with the establishment, as measured by SIMCE examinations (Table 3.05).

3.8.3. Age and experience

Although, Rodríguez Fuenzaliada (1996) reports a tendency for younger, less experienced teachers to have greater feelings of deception or indecision about their teaching careers, the stronger trend appears to be that younger teachers are generally better satisfied than their older peers. The pattern is not always a linear one, however, as it is shown that dissatisfaction peaks during mid career lives, to subside again as the end of the career approaches (Diaz Hernandez, 1990; Cornejo & Rodríguez, 1997; Gutierrez Sanchez *et al.*, 1997). This U shape in dissatisfaction echoes relationships found in teachers of different ages and experiences outside Chile (Mercer, 1997) and workers outside the profession (Kacmar & Ferris, 1989).

That younger teachers may be more satisfied than the older more experienced teachers is reported not only by teachers but the students themselves. Errázuriz et al. (1994), for example, found that when first year university students were asked for their opinion on teachers within the secondary school system, they remembered the young teachers to be full of energy and ideals centred on developing a different type of

education and being more vivacious in their pedagogic practice. With time and a lack of support, however, this enthusiasm died.

As mid career approaches, teachers may begin to perceive that they are fewer and fewer possibilities open to them for a career change, perhaps due to their increasing age and the number of years of service already invested in their career. They continue to work, therefore, in situations they consider uncomfortable both personally and professionally. Low social evaluation of the profession, low pay and a lack of personal and professional fulfilment are the main causes of their feelings of dissatisfaction as are excessive amounts of administrative work, time spent in the classroom, lack of time in general, poor school climate, problems with management and unmotivated students (Cornejo & Rodríguez, 1997). Further explanations as to why this middle group of teachers slump in their satisfaction may be linked to the possibility of the development of greater aspirations and demands of the profession or employment, as teachers become more established in their careers (Diaz Hernandez, 1990).

After this mid career period, teachers appear to regain some of their previous contentment. This may be something of an illusion, however, as resignation to the job situation or a bias in the sample associated with the fact that actively dissatisfied teachers may have left the profession by this point, may explain this occurrence (Gutierrez Sanchez *et al.*, 1997).

Not only do levels of satisfaction differ as the career and age of the teacher progress but so too does the nature of this satisfaction. The stresses and pressures teachers feel affect them when they first started in the career derives from the actual problems of teaching, such as dealing with the curriculum, time management, class discipline, size and control (Mendez Ferrada & Bernales Leiva, 1996). Professional satisfaction is associated with an evaluation of initial training and its influence upon the reality of the teaching world, and work satisfaction with institutional conditions such as resources, climate, personal and pedagogic relationships. Stress related with having to work in different establishments are mentioned, as are economic conditions especially if compared with the length of training of people entering other careers with similar training periods (Cornejo & Rodríguez, 1997).

As teachers progress, however, and perhaps as they begin to learn the skills of class control and time management, pressures change. Factors such as the high amount of administrative work required and the long hours required to earn a decent wage and social valuation of the profession slowly become more relevant for the older teacher. A deterioration in self-concept is also thought to have occurred (Mendez Ferrada & Bernales Leiva, 1996; Cornejo & Rodríguez, 1997).

These studies would suggest that it might not only be a general inclination to become more dissatisfied as one gets older but that central pressures change. This may be because different things becoming salient as the life of the teacher progresses, e.g. the financial worries of a family and time commitments outside of profession. Alternatively, Mendez Ferrada & Bernales Leiva (1996) suggest the system places external burdens upon teachers to the point where difficulties related to the classroom and teaching itself are displaced and fade in comparison to worries associated with economic pressures and the working atmosphere. These findings echo those found of job satisfaction in non-Chilean contexts.

Summarising the findings presented above, it would seem that younger teachers, working in one establishment preferably connected to a church authority, private fee paying in administration, where class sizes and other working conditions are superior will be most likely to be satisfied. Factors of work most likely to constrain teachers' feelings of satisfaction are widely related to elements outside the actual classroom and teaching situation (e.g. salary, recognition and valuation by society, job security, relationships with colleagues and management, career advancement, identification with the establishment, physical working conditions, school climate, work load, time management and participation decision making). Although external work pressures seem to dominate, class related stresses are of importance also (e.g., relationships with students and associated student characteristics, student motivation and behaviours, the nature of the work content and whether it leads to feelings of personal and professional growth, a sense of vocation and the usefulness of initial training). The importance of these factors will differ in magnitude and priority depending on the characteristics of the school, student and teacher under investigation.

The aim of this chapter has been to provide a feeling for the educational context found in Chile in which the main research questions of the thesis can be viewed. Specific

focus has been given to the teacher within this socio-cultural environment bearing in mind it is the influence of this actor upon student outcome that is of primary relevance.

The main research questions that will be addressed within this Chilean context will now be described.

CHAPTER 4 RESEARCH QUESTIONS AND HYPOTHESES

This chapter outlines the main research problem and the hypotheses that it generated. Supportive questions that serve to add deeper understanding of the scenario that surrounds the research as a whole are also addressed.

4.1. Research questions

4.1.1. Main research question

The main research question addressed in this thesis was:

Does a relationship exist between job satisfaction in science teachers and the outcomes of their students?

It would seem intuitive that satisfaction would improve teacher motivation, dedication and even practice, which, in turn, have positive influences upon students. This needs, however, to be investigated empirically.

Two central student outcomes were the focus of this research namely student attitude to, and achievement in, secondary school science. It is proposed that it is through student beliefs about teachers' job satisfaction, and the attitudes to science, to which these beliefs contribute, that job satisfaction (via teacher practice) influences student behaviour, behaviour that is associated with optimum achievement. This proposal is based on the Fishbein & Ajzen model (Figure 2.01; Chapter 2).

In the Fishbein & Ajzen model, beliefs about the attitude object amalgamate to create a general attitude to that object, which in this research is alternatively the subject of science in school, the science teacher or science as a future career. Students may hold various beliefs about these three objects that are likely to be diverse and of lesser or greater weighting in the extent to which they contribute to the overall attitude to each of these objects. This study looks specifically at the contribution of the beliefs of students concerning the satisfaction of the teacher. These beliefs are seen as particularly important as they represent a possible gateway through which teacher job satisfaction may be associated with student outcomes.

Students' beliefs about teacher job satisfaction are themselves under the influence of a range of factors, the teacher herself and her true job satisfaction being the most obvious.

Teacher job satisfaction can be viewed from two standpoints, either those feelings of satisfaction with the job as a whole (overall job satisfaction) or teacher perceptions and valuations of individual and specific job characteristics. Both of these options will be explored in this research, the former as summarised in Figure 4.01 and the latter in Figure 4.02. Accompanying these figures are the associated research hypotheses.

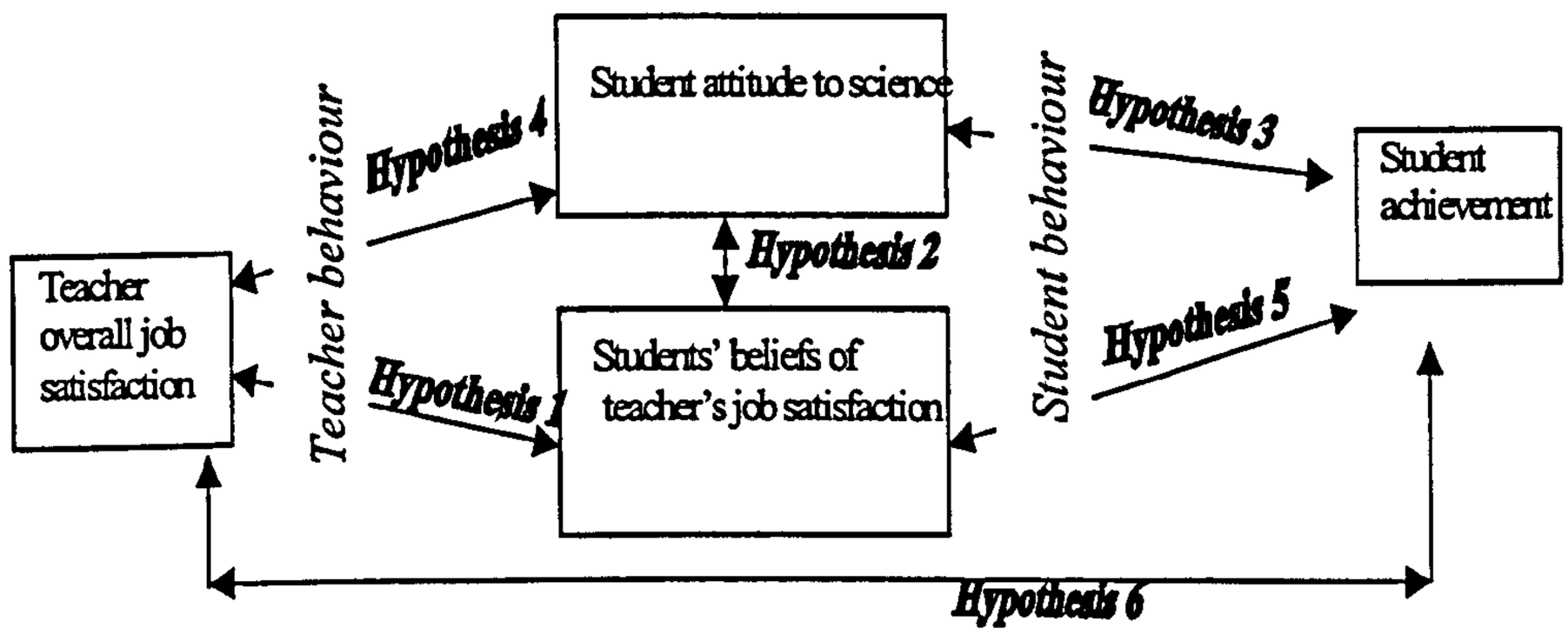


Figure 4.01: Model of relationship between overall job satisfaction and student attitude and achievement

- **Hypothesis 1:** Teacher overall job satisfaction is associated with student perceptions/beliefs thereof.
- **Hypothesis 2:** Students' beliefs about their teachers' job satisfaction are related to their attitudes towards science as a career, the science subject and /or science teacher.
- **Hypothesis 3:** Student attitude towards science as a career, the science subject and/or science teacher is associated with student achievement

Other alternative relationships were also investigated as summarised in hypotheses 4, 5 and 6.

- **Hypothesis 4:** Teacher overall job satisfaction is related to student attitude towards science as a career, the science subject and/or the science teacher.

- **Hypothesis 5:** Student perceptions of teacher job satisfaction are related to student achievement
- **Hypothesis 6:** Teacher overall job satisfaction is related to student achievement

As teachers may be satisfied with certain components of their job and not others, the influence of teachers' feeling towards individual elements are investigated. Not only do these components tap in greater detail the sentiments of the teacher but, if found to be related to student outcomes, their identification will facilitate choice as to which area of a teacher's work life might be improved so as to optimise the quality of education given and received. Figure 4.02 outlines where the addition of job components may be made to the model. These job components are not placed in any particular order, other than alphabetical, as classification of these will develop during analysis presented in later chapters.

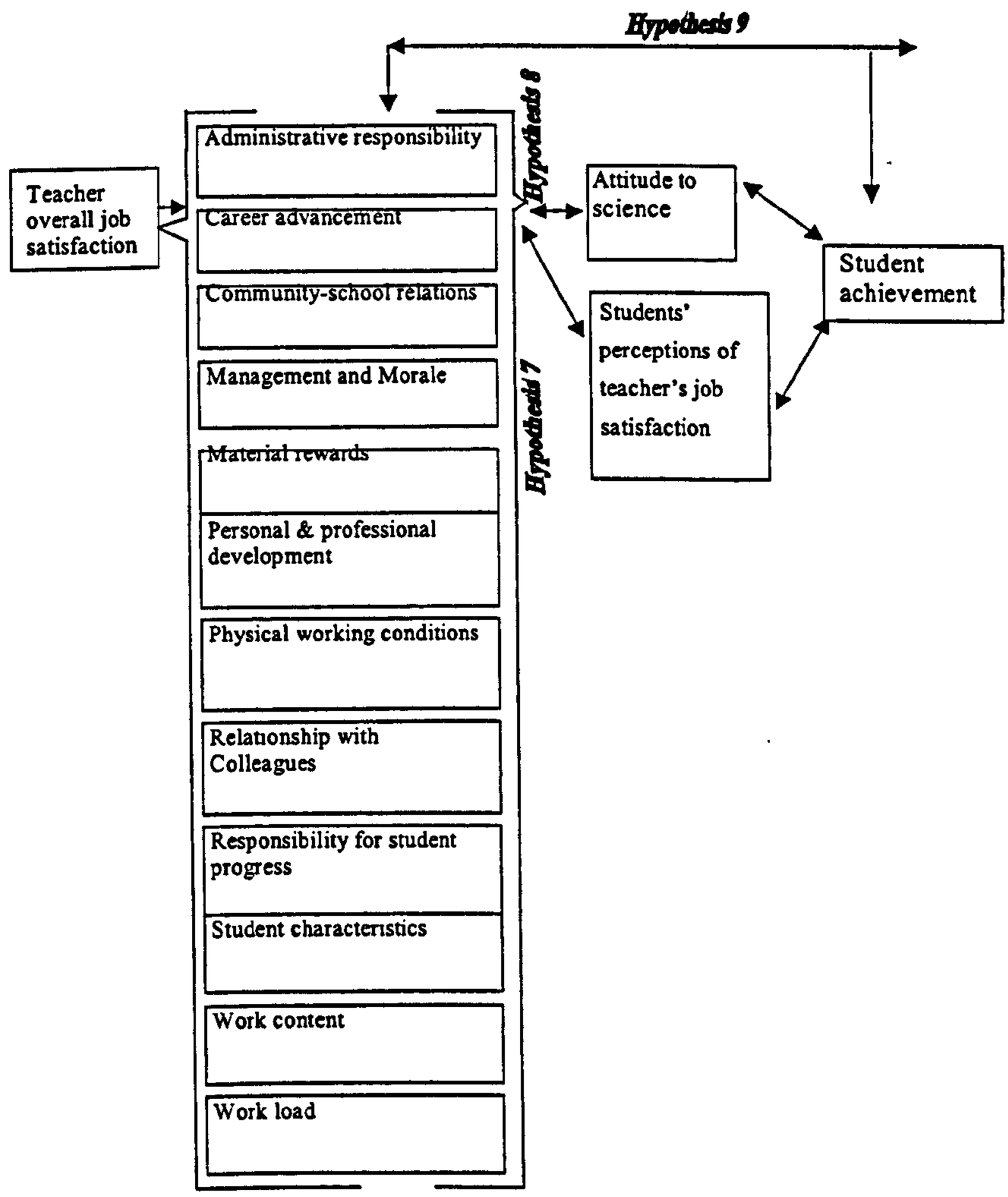


Figure 4.02: An expanded model of relationships between overall job satisfaction, teacher reward/value scales in a range of job components, student attitudes and student achievement.

- **Hypothesis 7:** Teacher reports of job characteristic rewards and/or values are associated with student perceptions of teacher job satisfaction
- **Hypothesis 8:** Teacher reports of job characteristic rewards and/or values are associated with student attitude towards science as a career, the science subject and/or science teacher.
- **Hypothesis 9:** Teacher reports of job characteristic rewards and/or values are associated with student achievement.

It is important to stress in these hypotheses that the direction of relationships is not specified. Where relationships between student outcomes and teacher satisfaction are found, therefore, two conclusions may be drawn: either teachers' job satisfaction influences student attitude and achievement or, and equally possible, student achievement and attitude contribute to teacher satisfaction. For this reason reciprocal relationships are represented in the models presented (Figures 4.01 and 4.02).

These hypotheses will be investigated in Chapter 9.

4.1.2. Supportive questions

In addressing the main questions, others arise that serve to enrich the understanding of the relationships at hand. If one is to assess the influence of teacher job satisfaction it is necessary primarily to gain insight into its nature. For this reason the following questions are addressed:

What job components contribute to overall teacher satisfaction?

and

What background variables (teacher, student and school characteristics) affect teacher overall job satisfaction and/or their feelings towards the distinct job components?

These questions are addressed in Chapters 6, 7 and 8

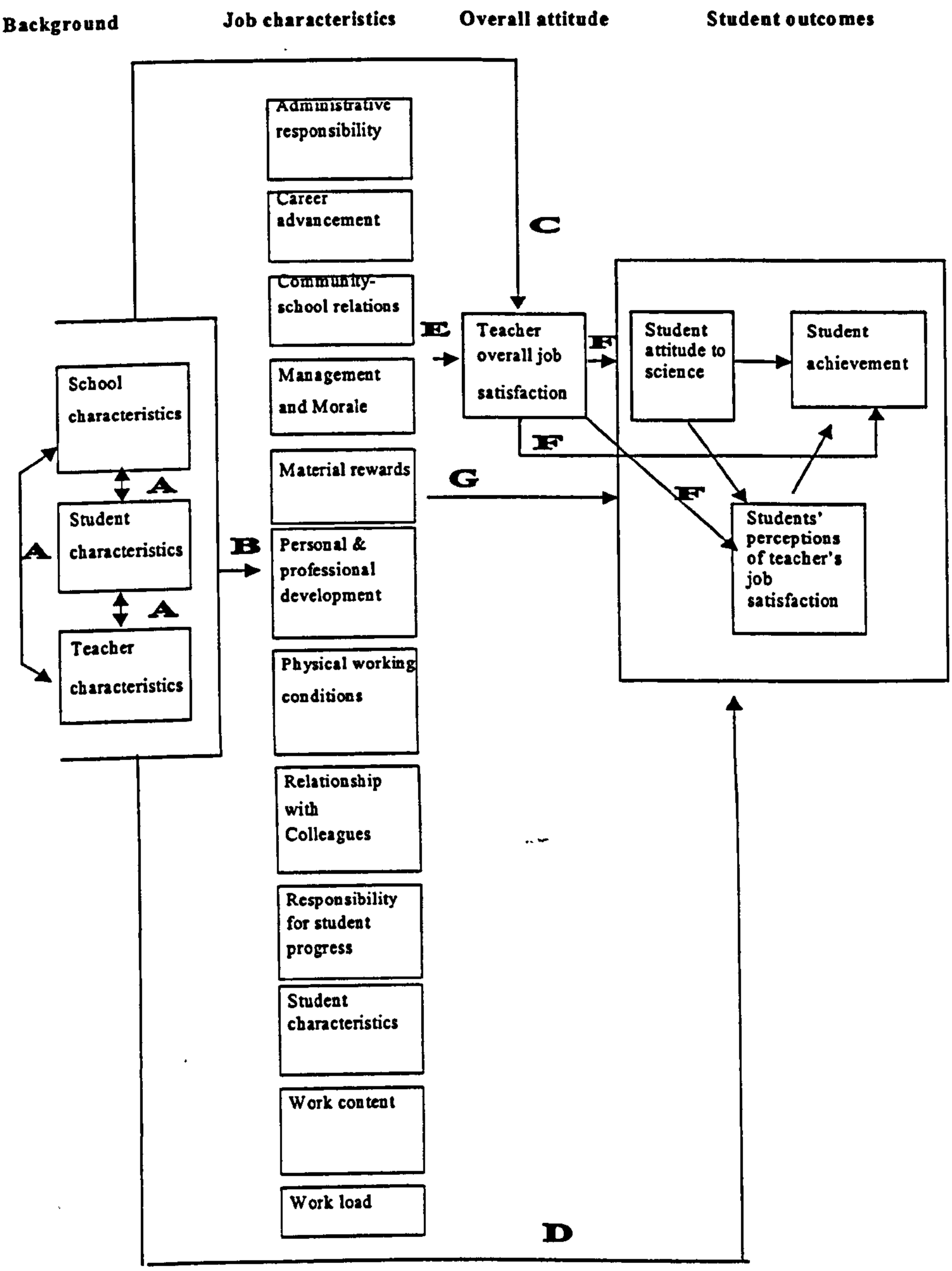
It is accepted that teachers are not the only influence upon student outcomes and that a multitude of other factors may come additionally into play. It is essential to control as many of the important factors as possible either through sampling strategies or statistical management of these latter variables. In doing so further questions are answered:

What background variables (teacher, student and school characteristics) affect student outcomes (beliefs about teacher job satisfaction, attitudes to science and achievement in science)?

This question is addressed in Chapter 6.

The supportive questions presented here are not the chief focus of the present thesis but are worthy of consideration in gaining a more profound perspective of the effect of teacher job satisfaction upon students. An outline of the thesis as a whole incorporating the described objectives is presented in Figure 4.03.

The backbone of the issues to be addressed in the research have been presented here. Greater detail will become clearer as chapters progress. The chapter that follows begins this clarification process, describing the methodology that was used to address the above questions.



A=Associations between background characteristics (Chapter 6);
B=Associations between background characteristics and individual job components (Chapter 6);
C=Associations between background characteristics and student outcomes (Chapter 6)
D=Associations between background characteristics and student outcomes (Chapter 6);
E=Associations between teacher reports on individual job components and overall job satisfaction (Chapter 7);
F=Associations between overall job satisfaction and student outcomes (Chapter 9);
G=Associations between teacher reports on individual job components and student outcomes (Chapter 9).

Figure 4.03: Summary of research questions

CHAPTER 5 METHODOLOGY

The general methodological approach chosen to address the issues at hand has been quantitative. This was chosen in preference to a qualitative investigation as it was felt that evidence of some generalisable trend in relationships between teacher satisfaction and student outcomes needed to be first established before methods that hone into specific issues, such as interviews, had been employed. Furthermore, a quantitative study would generate the initial data, in an unfamiliar context and exploratory analysis, from which effective interviews might be generated. A small component of the methods approach the qualitative, being more open ended in their structure. They were used in an attempt to confirm or enlarge upon the results generated in the quantitative analysis.

This chapter outlines the sampling methods and instruments used during data collection and each instrument, where appropriate, is presented with a description of content, development, validity, reliability, scales and general procedure used during implementation. Management and ethical issues are also addressed, followed by a general discussion of the limitations in the research design.

5.1. Instruments

Four instruments were applied in this research. These measured:

- Student attitude to various aspects of science;
- Teacher overall job and facet specific satisfaction;
- Student achievement in science;
- General student ability;
- Student family socio-economic status;

The instruments measuring teacher job satisfaction and student attitude to science employ Likert-type scales. Several factors supported this choice. The first was the availability of items measuring both teacher job satisfaction and student attitude to science, in whole instrument form or otherwise, from which item banks could be created.

A second factor was that measurement techniques such as Thurstone scales were found impracticable due to the complexity and resources required (a 60 judge panel has been recommended to estimate the values to be placed on each belief statement in a 11 point scale from +5 to -5). Likert scales rely only on the evaluation of the instrument developers. Thurstone scales are perhaps preferable in that they approximate continuous type data more closely and are more appropriate for parametric statistical analysis and measurement of attitude change. The cross sectional nature of the study and that the reliabilities of the Thurstone and Likert scales are similar, however, led to the conclusion that the use of the Thurstone scale in this instance does not justify the time and resources required of it (Oppenheim, 1992).

Semantic differentials were also considered but have also been excluded as it was felt that such scales are of too abstract a nature to be used in this study.

5.1.1. Student attitude

5.1.1.1.Content

This instrument collected data on student attitudes to science, their beliefs concerning teacher job satisfaction and some student background characteristics.

Student attitude to science is a multi-dimensional concept and individual scale scores were considered as opposed to an overall science attitude score. The student attitude scales to be investigated are attitude to:

- Science as a career
- Physics as a class/subject in school
- Biology as a class/subject in school
- Chemistry as a class/subject in school
- Present Physics teacher
- Present Biology teacher
- Present Chemistry teacher

Alternative scales are available in the literature, for example, attitude to science as an inquiry, attitude to the nature of science, and attitudes to the social implications of science. These, although relevant, have been excluded from the study for several reasons. Firstly, it was felt preferable to investigate fewer components of student

attitude to science and maintain a questionnaire of manageable length, capable of maintaining student interest. Each scale, however, would still have a sufficient number of items to achieve acceptable reliability. Secondly, several of the excluded scales were felt in many instances to include items that required factual knowledge from the respondent. As attitude was the centre of the study, it was decided to exclude these items. Finally, scales were chosen that were considered intuitively to have a potential influence, or be influenced by, teacher job satisfaction.

Additional scales were included that measured student perception of:

- Physics teacher job satisfaction
- Biology teacher job satisfaction.
- Chemistry teacher job satisfaction

In an attempt to improve the depth of understanding provided by this research and shift the study from one that is purely based upon an 'input/output explanation of findings' to one that incorporates student thought processes as a mediator (Wittrock, 1986), open-ended questions were included in the instrument. Students were asked if they felt their teachers to be satisfied with their jobs and to explain why they thought this to be so. They were also asked if, and why, they felt this satisfaction had an influence on their own attitude to and achievement in science. The latter questions, however, were often misinterpreted by students and was, therefore, excluded from further analysis.

The English and Spanish versions of the instrument can be consulted in Appendix 1 and Appendix 2.

5.1.1.2.Development

An item pool was formed from a collection of established instruments used in the attitude to science literature (e.g., National Foundation for Educational Research, 1970; National Assessment of Science, 1975; Ato & Wilkinson, 1982; Simpson & Troost, 1982; Germann, 1988). Items were then selected based on the following criteria:

- Items written in the past tense were discarded as were those considered similarly ambiguous or confusing;
- Items that were anticipated not to discriminate between individuals and items referring to more than one theme were also removed or modified.
- Items that contained universals (e.g., always/never) were modified by the removal of these phrases. This was done as these terms are open to wide and different interpretations by students of similar attitudinal levels. Double negatives were also removed as they were seen to increase the ambiguity of items.
- Items were kept as short as possible, complex wording and structure avoided and wording selected that was thought to be appropriate to the target groups.
- Items were removed that were seen as factual in nature.
- Items that were thought to be repetitions of each other (so called specific bloaters) were removed so as to avoid false inflation of reliability figures (Oppenheim, 1992).

Throughout this selection, compromises were made between the need for a large selection of items, in order to create a reliable scale (Gardner, 1995) and the danger of an unmanageably long and tiresome questionnaire.

Although items concerning attitudes to science were readily available from the literature, items for the perception scales were original in nature. They were generated through a combination of experience in science teaching and a transfer of issues that had been noted in the teacher questionnaire, e.g. observation of scales in the teacher questionnaire concerning relationship with colleagues resulted in the item of "My teacher enjoys working with other teachers in the school". Some items in this scale were shown not to discriminate widely between students indicating that there were some areas of the teachers' lives about which students have little perception. The latter item was one such example. Items for this scale were also generated through an initial categorisation and analysis of the open-ended questions in pilot data.

It has been recommended that items in the questionnaire be arranged randomly so as to prevent a halo effect in student answering of particular scales (Oppenheim, 1992). This random assortment may confuse the student when answering, however, and a more structured questionnaire arranged into set scales was, hence, employed.

In selecting items, a balance of positive and negative statements was attempted so as not to lead the student in any particular attitude direction that might occur if one or the other had been employed. This strategy also minimised pattern answering. Retrospectively, although this logic is theoretically acceptable, it was often felt that in an attempt to produce an adequate number of negative items per scale, items were produced that were easily misread by the lower ability or less careful student and in future studies it is thought preferable to sacrifice the former theory in favour of clarity.

After initial selection from the pool, items were sorted into scales either intuitively or by basing the choice on recommendations in the relevant literature from which the items had been drawn. A panel of 3 judges reviewed the items, making judgements on

- the presence of specific bloaters within a scale
- the allocation of an item to a scale based on the description of what the scale is measuring
- the positive or negative evaluation figure placed on each item (See Scoring for Instrument; Appendix 3).
- possible ambiguity

Judges were chosen that were considered expert in science education or questionnaire design. A fourth Chilean judge was subsequently approached, who, through experience of educational research in the region of study, was able to comment on the contextual validity of the instrument.

A preliminary pilot with 20 English students in their GCSE year, and close in age to students in the Chilean sample, was conducted in a trial of the instrument. Adjustments in format were made as a result of this procedure.

The instrument was translated into Spanish by a professional English/Spanish translator and back translated by the researcher to ensure that the items had kept their original meanings. To cater for the idiosyncrasies of the Chilean language, the questionnaire was reviewed together with two Chilean English language teachers who assisted in the alteration of items they felt could be misinterpreted.

The questionnaire was applied to a pilot Chilean school in a class of 46 students of the second year (*Segundo Media)* of secondary school. Munby (1982) argues that the panel of judges method of proving validity makes the tenuous assumption that the adult judges make the same meaning of questions as would students. Students were given, therefore, the written opportunity in the pilot instruction to indicate on the questionnaire items with which they had difficulty. Unfortunately, the majority of students did not take up this opportunity. Randomly selected students in the pilot were also asked verbally if they had had any difficulty or inhibition in answering the question posed, but once again students appeared to be reticent in expressing their concerns to an outside researcher. The instrument was then revised based on the outcomes of the above procedures. Items that failed to discriminate between respondents sufficiently were removed as were items that showed low internal consistency. Items found to be ambiguous were rephrased and the addition of items derived from open-ended questions were made. A second pilot study would have been desirable but this was not feasible considering time and resource constraints. The instrument was reviewed again by one of the Chilean English teachers as language issues had arisen during pilot analysis.

In the final research application of the student questionnaire, a concern developed with regard to its length and resulting student fatigue when answering scales near the end of the instrument. To avoid superficial and careless responses being restricted continuously to the same scales, and the introduction, therefore, of possible bias, equal numbers of two versions of the questionnaire, differing in the order of scale appearance, were administered to the sample population.

Internal reliability was calculated for each scale using Cronbach's alpha and items that reduced the overall alpha during scaling procedures were removed. External reliability was also calculated by correlating test and retest administrations of the instrument, with one week between applications to a small sample of students from different schools (Pearson's r). Although ideally a longer period between applications was desired, the constraints placed on the researcher by school time-tabling led to this arrangement being accepted. The internal and external reliabilities of the final scales, after final item selection are presented in Table 5.01.

Table 5.01: Internal and external reliabilities of scales in student attitude questionnaire

SCALE	Internal reliability (α)[2]	External reliability (r)
Attitude to science as a career	0.9 n=540	0.8*** n=36
Attitude to Physics as a subject at school	0.9 n=548	0.9*** n=34
Attitude to Biology as a subject at school	0.9 n=549	0.8*** n=36
Attitude to Chemistry as a subject at school	0.9 n=547	0.6** n=35
Attitude to Physics teacher	0.9 n=548	0.8***; n=36
Attitude to Biology teacher	0.9 n=548	0.8**; n=36
Attitude to Chemistry teacher	0.9 n=545	0.7***; n=36
Perception of satisfaction of Physics teacher	0.9 n=544	0.8***; n=34
Perception of satisfaction of Biology teacher	0.8 n=548	0.7***; n=35
Perception of satisfaction of Chemistry teacher	0.8 n=547	0.6*** n=34

Acceptable internal and external reliabilities of each of the scales were obtained. Some concern must be borne in mind during discussion, however, for the external reliabilities of the attitudes to Chemistry which were consistently the lowest and the only scales to have external reliabilities below 0.8. They remain sufficiently high to warrant acceptance but may signify that students are less concrete in the attitudes they have developed within the Chemistry classroom environment.

5.1.1.3.Factor analysis

There is some danger of confusing internal consistency with unidimensionality (Gardner, 1995). A scale that is unidimensional will be internally consistent but that the reverse is true is not necessarily the case. A high alpha will indicate that the item correlates highly with only some of the other items and does not constitute evidence that all items are measuring the same thing (i.e., that the scale is unidimensional). Therefore, items applied in the final instrument were 'factored' into unidimensional scales for final analysis, so as to ensure that all items within a scale measured the same construct, which the factor name describes. Items loading onto a single factor share

[2] * $p<0.05$
** $p<0.01$
*** $p<0.001$.
Note that here, and throughout this document, these symbols will be used to donate levels of significance.

common variance - that is they all measure a common construct – and produce an unidimensional scale.

One disadvantage of the factor analysis, which is of practical concern, is the size of the sample seen as sufficient for accurate analysis. Kline (1994) recommends a minimum sample of 100. The ratio of subjects in the sample to the number of variables studied should be a minimum of 2:1. These sample size requirements made it impossible to factor analyse items in the pilot studies conducted here. It is assumed that subjects, taking part in the initial Chilean pilot, cannot be reused in the final sample due to a pre-awareness of the questionnaire/test content. Individuals not tested but in the same class or school, may also suffer from similar contamination due to communication, between friends, for example. If the pilot had been extended to other participating schools to increase the pilot, samples of 100 or more would have exhausted a large percentage of the final study sample, a sample limited by research time and resources. For this reason at the pilot stage of item selection, item analysis was employed as an alternative means of dividing the items into scales. This method allows for smaller samples. Each item is correlated with the total score for the proposed scale. Items that correlated highly were selected on the assumption that they are measuring a similar construct to most of the other items. This was used as an initial development tool to allocate or confirm the allocation of an item to a scale, based upon this measure of internal consistency.

In the final analysis, however, the sample size and subject/variable ratio were sufficient for factor analysis to be successfully conducted.

An exploratory factor analysis was conducted on final instrument items. The alternative was confirmatory analysis. The latter seemed more appropriate at first, as most of the items have been placed into scales based on their previous analysis in the literature and the judgement of the researcher. Confirmation of such scales would follow. However, Kline (1994) gives examples where the measurement model of confirmatory analysis, applicable to this type of task, yields results little different from exploratory analysis. He recommends exploratory analysis as a simpler technique and it was the method of choice in this study.

There are two stages that need to be considered in factor analysis: the first is a condensation stage where the correlation matrix is condensed into a simpler, more

manageable form. There are several methods of condensation that, when dealing with large sample sizes, yield comparable results. Principal component analysis was used in this analysis. Rotation of the factors was necessary as the condensation process can produce algebraic artefacts that obscure the interpretation of the factors produced. Rotation makes interpretation clearer without changing the amount of variance that is explained by that factor (Kline, 1994).

Two methods of rotation exist:

- orthogonal rotation
- oblique rotation

Orthogonal rotation assumes that no correlation exists between factors, whereas oblique rotation accepts that such a correlation may exist. In the present study, oblique rotation was more appropriate for the student attitude to science scales as it is feasible that a relationship exists between factors, a fact that later analyses confirmed (Section 6.3; Chapter 6; Section 9.2.4; Chapter 9). The Direct Oblimin means of oblique rotation was used.

Item selection was made on the loadings resulting from the above factor analysis of items. The items from each of the science subjects were factor analysed separately along side the attitude to science as a career and in each case 4 clear factors emerged. In an initial selection based on factor analysis alone, loadings of above 0.5 were selected.

Although factor analysis produces relevant factors, these need to be adequately identified. One method of achieving this is by "co-factoring" an established instrument simultaneously to the new instrument. Knowledge of the identity or the constructural meaning of the items from the old instrument enables the factor, onto which the old and new items load, to be identified. This technique has not been chosen here as an instrument acceptable in context and content could not be located.

Another alternative is the use of an external criterion. Initially it was proposed that judgements of student attitude be made by the science teachers themselves and this opinion be used as an external criterion with which to cofactor the student attitude

items. This method was rejected for 2 reasons: the first was the questionable validity of teachers' judgement on the personal attitudes of their students and the second the increased inconvenience to teachers of an additional and lengthy task that the collection of this criterion would cause.

Identification of factors was achieved, therefore, on what the majority of the items in the factor appeared to be measuring intuitively, i.e., if the subjective scale allocations were confirmed through analysis, then the initial judgement of the researcher had been confirmed and the identity of the factor made. If items loaded onto factors that were contrary to what were expected and their new allocation made no theoretical sense then these items were omitted, as were those items that were expected to load on a particular factor but did not.

The final item selection based on a combination of factor loadings, reliabilities and face value validity are presented in Table 5.02 alongside their factor allocations and loadings based on a factor analysis of the final items chosen.

Table 5.02: Final scale allocation of items for student questionnaire and associated factor loadings

Attitude to science as a career	Physics Loading	Biology Loading	Chemistry Loading	**Attitude to class**	Physics Loading	Biology Loading	Chemistry Loading	**Attitude towards teacher**	Physics Loading	Biology Loading	Chemistry Loading	**Perception of teacher satisfaction**	Physics Loading	Biology Loading	Chemistry Loading
Item 2*	0.7	0.7	0.7	Item 1	0.8	0.8	0.9	Item 1	0.9	0.9	0.9	Item 3	0.7	0.7	0.8
Item 3	0.8	0.8	0.8	Item 2	0.8	0.7	0.9	Item 2	0.8	0.7	0.8	Item 4	0.8	0.8	0.8
Item 4	0.8	0.8	0.8	Item 3	0.8	0.7	0.6	Item 5	0.8	0.8	0.8	Item 5	0.8	0.8	0.8
Item 5	0.8	0.8	0.8	Item 4	0.7	0.8	0.7	Item 6	0.8	0.8	0.8	Item 6	0.8	0.8	0.7
Item 6	0.7	0.7	0.7	Item 5	0.9	0.8	0.9	Item 8	0.8	0.9	0.8	Item 7	0.9	0.8	0.8
Item 7	0.8	0.8	0.8	Item 6	0.8	0.8	0.8								
Item 8	0.8	0.8	0.8	Item 7	0.9	0.8	0.9								
Item 9	0.7	0.7	0.7	Item 8	0.7	0.8	0.8								
				Item 9	0.7	0.7	0.7								

*item numbers correspond to question numbers in instrument –see Appendix 1 and 2

5.1.1.4.Scale description

Brief descriptions of the meaning of each scale and considerations to be taken into account when scales are used in analyses are presented in Table 5.03

Table 5.03: Student attitude and belief scale descriptions*

Scale	Description	Considerations
Attitude to science as a career	This scale measured student attitude to science as: a career in general a career they specifically would like to follow a subject they would consider specialising in at a later stage in their education	The disadvantages of this scale are two-fold. Firstly, the scale was based on items used largely in the United Kingdom and the USA and although a Chilean pilot was performed, it is unsure what students understood exactly by a career in science. Items, for example, that ask students if they would like to be a scientist or work in a laboratory (items 2, 3, 4) when they complete their education, may be overly specific in their nature causing students wishing to follow applied science careers (e.g. medicine) to be falsely represented. This scale, more than any of the others, is likely to be highly influenced by factors outside the school such as parent expectation, presentation in the media, etc..
Attitude towards Physics /Biology/Chemistry/ as a subject in school	This scale measured the attitude students have towards the science subject as a subject they experience within the school environment	The nature of the scale was such that it appeared less likely that factors external to the school would have a major influence.
Attitude towards / Physics Biology/Chemistry teacher	This scale measured the students' attitude to their science teacher in terms of their liking of the teacher.	The nature of the scale was such that it appeared unlikely that factors external to the school would have a major influence. This was thought to be even more so than the scale that measured attitude to the science subject.
Perception of the satisfaction of the Physics/Biology/Chemistry teacher	This scale measured the students' perception of how happy the teacher is in terms of whether the teacher enjoyed working with students and teaching their subject.	As might have been expected, items that measured perceptions of teacher satisfaction in areas, other than those involved in direct contact with the student, did not score sufficient loadings to be included in the scale. Students are only aware it seems of classroom dimension of their teachers' professional lives.

*Details on how the scales were scored can be viewed in Appendix 3.

5.1.2. Teacher job satisfaction

5.1.2.1.Content

This questionnaire included a scale that measured teachers' overall job satisfaction as well as questions that collected information on teacher background variables. As it was conceivable that teachers might be satisfied with certain aspects of their work (e.g. pay) but unsatisfied with others (e.g. collegial support), scales were also used that investigated several particular job components or facets involved in teaching.

As described previously (Section 2.10.4; Chapter 2) overall job satisfaction is formed from the sum of one's feelings towards particular job facets, some of which may be of greater relevance than others. When considering the contribution of each job component, it has been suggested that two measures need to be considered:

- the amount of the job characteristic perceived by the teacher to be present (*Reward*)
- the importance (*Value*) placed upon the characteristic in question (Locke, 1983; Kalleberg, 1977; Poppleton, 1989).

Therefore, where items were presented that questioned teachers' feelings towards an aspect of a specific job component, two responses were elicited per item, the first measuring *reward (How much is this characteristic present in your work?)* and the second measuring value (*How important is it for your satisfaction with work?*).

The job components included in the questionnaire were the following:

- Administrative responsibility
- Career advancement
- Relationships between the school and the community
- Job autonomy
- Job scope
- Management and morale
- Material rewards
- Personal and professional development
- Physical working conditions
- Relationship with colleagues

- Responsibility for student progress
- Student characteristics
- Work content
- Work load

Teachers' perceptions of their own classroom teaching practice were also assessed. For each item addressing this issue teachers were asked:

How difficult do you find the procedure/method to do in practice?
How much do you use the procedure in their teaching?
How important is it for you to use the procedure for your satisfaction with work?
How important is the procedure/practice for the learning of your students?

The scales concerning teachers' classroom practice described procedures involved in:

- Individual teaching
- Lesson control
- Pupil responsiveness

In addition to Likert type scale items, as above, teachers were asked to describe, in an open-ended format, the areas of their work with which they were satisfied or dissatisfied. The objective of this was to triangulate results obtained from the Likert style questions on distinct job components with these results, obtained in a more flexible form of questioning.

Prior to attempting the instrument, teachers were first asked to list factors in teaching that caused them satisfaction or dissatisfaction. Within these two categories they were asked to consider their attitude both to teaching as a profession, and to teaching as it was experienced in their present employment. An additional question was located within the questionnaire that required teachers to list further sources of satisfaction and dissatisfaction that they might wish to add to their commentaries. This 'pre' and 'within' instrument questioning was employed so as to extract teachers' initial response to this questioning, without the leading or bias that exposure to the questionnaire might produce. This was followed by the 'top up question' which, after exposure to the closed/Likert scale questions of the instrument, hoped to draw out more profound

responses from teachers, after themes in the questionnaire had been introduced to them. The replies to these two open question types were pooled for analysis, as were data on professional and employment satisfaction, as distinctions between the latter themes were not clearly made in the teachers' responses.

Teachers were also asked, to use an open ended question format, to express their views on the influence their satisfaction might have on their students' achievement and attitude. This was included to generate possible reasons for the relationship, if found to be present. Again, as with the student equivalent of this question, the data collected in this fashion was not as lucrative as had been hoped and was excluded from further analysis.

The English and Spanish versions of the instrument can be consulted in Appendix 4 and Appendix 5.

5.1.2.2.Development

An item pool was created from published instrument items (e.g., Lester, 1987; Poppleton, 1989; Abu-Saad & Hendrix, 1995; Perry *et al.*, 1995) although the instrument was based largely on that used in the 'Teacher Professional Study' (TPS) (Menlo & Poppleton, 1990; Poppleton, 1992). The job satisfaction literature is often criticised for not building on the findings of previous research, each study developing a new measurement instrument. The use of an established instrument, albeit adapted to the Chilean context, hopes to combat such criticism as well as facilitate comparison with countries in which the instrument has already been used.

Items were selected from the item pool that fitted the criteria mentioned in the development of the student questionnaire (Section *5.1.1.2*). All items selected were positive in nature to fit in with the general character and format of the TPS questionnaire. Poppleton (1989) supports this, indicating that by representing each item with a degree of favourability the job facets they describe can legitimately be regarded as perceived rewards and values.

Ideally a factor analysis of the TPS instrument would have been required. However, the size and subject to variable ratio of the teacher sample is insufficient for a successful procedure to be undertaken on instrument items. The allocation of items and the

unidimensionality of each scale, as guaranteed by previous work with this instrument, must be relied on (Poppleton, 1990).

Comments that a scale may conveniently have a single underlying trait in one context but a multidimensional nature in another, (Goldstein, 1995) need to be borne in mind, although the international application of the questionnaire gives some reassurance. Goldstein warns further of the lack of equivalence in sampling methods, difficulties arising in translations of instruments and the very different educational contexts that face international instrument transfer. These criticisms are relevant to any cross-country research including the TPS study. The lack of application of this instrument to either developing country contexts or, more specifically, the Latin American regions, is cause for further caution. Procedures, therefore, needed to be carried out that would try and combat some of these problems.

The validity of the instrument was maximised firstly through a panel of 2 English judges who reviewed the instrument based on the criteria described for the student questionnaire. Judges selected were considered expert in teacher effectiveness research or questionnaire design.

The TPS instrument and other pool items were translated into Spanish by a professional English/Spanish translator and exposed to the same language check procedures, as was the student questionnaire.

Although necessity led to the majority of the questionnaire being based on the TPS instrument, it was important that the questionnaire be relevant to the Chilean context. To achieve this, informal discussions concerning the research in general and teacher job satisfaction in particular, were held with the co-ordinator of secondary school reforms (MECE) of the Ministry of Education in Santiago and the co-ordinator of secondary science education in the provincial educational ministry. Additional discussion on teacher work conditions, satisfaction and dissatisfaction, was held with the regional representative of the main teacher's union (*Colegio de los Profesores).* The questionnaire was also presented to an university academic involved in educational research in the region who was able to comment further on the relevance and viability of the instrument. The latter discussions led to the addition or alteration of items in an adaptation of the instrument to the region, and the removal of items not seen as

contextually applicable. As illustrative examples, teachers may need to work in more than one institution to make up their full teaching hours. Items were, therefore included to determine if they saw the number of contractual hours as sufficient and whether they saw this as important to their satisfaction. Information on the number of schools and the hours worked in each school was also collected. Professional association membership is low in Chile and, therefore, questions eliciting information on membership to these groups was excluded.

The adapted questionnaire was piloted using 1 Physics, 1 Chemistry and 2 Biology, teachers who were asked to complete the questionnaire and give their comments on what perceptions or difficulties they had in doing so. A review of the pilot questionnaires was carried out and the instrument adapted further.

The main concern that arose both in discussion with pilot teachers (as well as other Chileans assisting in the instrument's development) was the questionnaire's length. One of the common themes that arose both in contact with Chilean teachers and in Chilean literature is the high workload teachers experience. An attempt to maximise the effectiveness of the questionnaire and minimise the inconvenience to teachers, led to it being shortened as much as possible without loosing items viewed as essential to the study.

The majority of schools involved in this research were participating to some degree in the educational reforms (*MECE Media*) being applied in secondary education. A scale that measured satisfaction with the ongoing MECE and other educational reforms that are now largely affecting teachers' working lives, therefore, seemed desirable, but was one of the scales that needed to be sacrificed in the curtailing procedure. Despite these efforts, the questionnaire has remained a long one and this is addressed as one of the drawbacks in the research.

Unlike the student questionnaire, an analysis of items after the pilot application of the instrument was not possible because only four teachers had been involved in this trial. Item analysis was conducted with the final study questionnaire items and those found to lower the internal reliability of each scale were removed.

In consideration of the limited time teachers had to participate in the study, only one application of the instrument was made, a fact that led to only internal reliability data being available on the instrument.

The internal consistency of the scales was calculated using Cronbach's alpha and the results of this procedure can be seen in Table 5.04. These reliabilities are compared to those calculated in the TPS study (Poppleton, 1990). Where scales were identical to those used in the TPS questionnaire, the reliability is presented alongside the latter scale reliabilities to facilitate comparison. If items have been added or removed to accommodate the scale for the Chilean context or to improve face validity of the original TPS, the unadjusted scale reliability and the adjusted scale reliability calculated for the present study are presented. Where the scale is a completely new one, the reliability of the new scale only is displayed.

Only the reliabilities of the importance/value scales were published (Poppleton, 1990) and, therefore, the reliabilities for the teachers' perception of the presence of the job characteristic (reward) for the Poppleton scales are not shown.

Table 5.04: Internal reliabilities of value scales from TPS study (Poppleton, 1990), internal reliability of TPS value and reward scales as used in the present study and internal reliabilities of new or adjusted scales

Name of scale	Internal reliability of TPS scale (Poppleton, 1990)	Internal reliability of unadjusted Poppleton scale as used in present study	Internal reliability of adjusted/new scale as used in present study
Overall job satisfaction	0.8	0.7	0.8
Administrative responsibility-			
Reward		0.7	unchanged
Value	0.8	0.8	unchanged
Career advancement			
Reward		0.9	unchanged
Value	0.7	0.7	unchanged
Community-School Relations			
Reward		0.7	unchanged
Value	0.8	0.6	unchanged
Job scope			
Reward		0.3	0.3
Value	0.6	0.5	0.5
Job autonomy			
Reward			0.1
Value	New scale		0.5
Management and morale			
Reward		0.8	unchanged
Value	0.8	0.8	unchanged
Material rewards			
Reward		0.6	0.7
Value	0.7	0.9	0.8
Physical working conditions-			
Reward			0.7
Value	New scale		0.6

Table 5.04 (Continued)

Personal and professional development			
Reward		0.8	unchanged
Value	0.8	0.7	unchanged
Relationship with colleagues-			
Reward		0.8	0.8
Value	0.8	0.9	0.8
Responsibility for student progress			
Reward		0.7	unchanged
Value	0.8	0.7	unchanged
Student characteristics			
Reward			0.6
Value	New scale		0.7
Work content			
Reward			0.6
Value	New scale		0.6
Work load			
Reward		0.5	0.6
Value	0.8	0.6	0.4
Individual teaching			
How difficult		0.2	unchanged
How much do I do this in my teaching		0.7	unchanged
How important is it for my work satisfaction	0.8	0.3	unchanged
How important is it for the learning of my students		0.5	unchanged
Lesson control-			
How difficult		0.3	unchanged
How much do I do this in my teaching		0.6	unchanged
How important is it for my work satisfaction	0.9	0.6	unchanged
How important is it for the learning of my students		0.7	unchanged
Pupil responsiveness			
How difficult		0.7	unchanged
How much do I do this in my teaching		0.3	unchanged
How important is it for my work satisfaction	0.8	0.7	unchanged
How important is it for the learning of my students		0.5	unchanged

Only scales with reliabilities above 0.6 were selected for further analysis, with the exception of the work load characteristic. This was maintained in the study because informal discussion and qualitative data indicated that work load appeared relevant to overall job satisfaction and the fact that the reward scale had met with the above requirement.

The final scale selection was:

- Overall job satisfaction
- Administrative responsibility
- Career advancement
- Community-School Relations
- Management and morale
- Material rewards
- Personal and professional development
- Physical working conditions
- Relationship with colleagues
- Responsibility for student progress
- Student characteristics
- Work content
- Work load

The teaching practice scales were also omitted from further study, as none of the four responses asked for per scale was sufficiently reliable across all three of the scales proposed. This was unfortunate as they provided an indication of teacher behaviour that may have added to the understanding of the study at hand. These measures would have been considered biased, however, Bourdieu's criticisms of self report on behaviour being particularly relevant. Three points are raised in his writings: firstly that some of the more subtle features of the subject's experience may remain unspoken or unwritten, that the subject assumes the outsider is unfamiliar with the context and, therefore, only replies in general terms and thirdly the desire of the subject to present himself in the best possible light (Williams, 1995). Such criticism could be transferred to all measures in this study and are specifically salient in the open ended questioning.

5.1.2.3.Scale Description

A brief description of the teacher scales is given in Table 5.05.

Table 5.05: Teacher scale descriptions

Scale	Definition
Overall job satisfaction	This scale measured teachers' general feelings of overall well being, firstly with respect to teaching as the profession they had chosen (i.e. if they enjoyed their profession, whether it had lived up to what they expected and whether they would go back into it if they had the choice again) and secondly the satisfaction they felt with the job they held at present
Administrative responsibility	The remaining two scales aim at measuring the satisfaction of teachers with their involvement in, or responsibility for, tasks other than actual classroom teaching. The first such scale is to do with responsibility for factors related to administration and management.
Career Advancement	This scale measures satisfaction with the opportunities for, and handling of, promotions as well as the adequate recognition of work.
Community-School Relations	This scale measures the degree to which teachers feel satisfied with their standing within the community with regard to the respect and support they receive.
Management and Morale	A measure of school climate assessing teacher feelings towards management and general staff morale
Material rewards	This scale measures satisfaction with pay, benefits, job security, the adequacy of work hours, number of work hours and vacation time
Personal and professional development	This scale measures the degree of satisfaction teachers derive from being involved in activities related to their personal and professional growth, e.g. attending courses, conferences, participating in research.
Physical working conditions	This scale presents items designed to measure teacher satisfaction with the provision of laboratory, computer and teaching materials, the extent to which classes are free from interruption and the pleasantness and adequacy of the areas in which they work.
Relationship with colleagues	This scale measured teachers' feeling towards other staff members and the degree to which they felt they received support and interacted with colleagues. Low values on such a scale are likely to indicate the degree to which teachers feel isolated socially and professionally in their work place.
Responsibility for student progress	This scale measures satisfaction with responsibilities more directly related to students such as social and academic evaluation, counselling, student welfare, work in the administration of the department and curricular development
Student characteristics	This scale measures the satisfaction of teachers with the nature of student they are teaching, e.g. levels of repetition, achievement, attitude to subject, etc..
Work content	This scale measures the satisfaction teachers have with the actual content or nature of their work, i.e. if teachers find the task stimulating, creative and absorbing.
Work load	The scale measures the satisfaction of teachers with the amount of work that is required of them in and out of school time

Instrument scoring for the scales seen in Table 5.05 can be viewed in Appendix 3. Individual items that make up each scale and the distribution of responses made to each item by teachers can be viewed in Appendix 6.

A criticism launched at much of the teacher job satisfaction survey work needs to be assessed at this juncture and concerns the uncritical incorporation of instruments from industry to the teaching environment. Kottkamp (1990) points out that despite evidence that the 'centre of the teacher's world is the classroom' few instruments include scales measuring teacher satisfaction with students and other components of classroom activity. This is partially true of the final format of the present instrument after scales pertaining to classroom practice were removed because of low reliabilities. Only two scales remain (*student characteristics* and *work content*) in which the actual teacher-student relationship or the teaching process itself is touched upon. It is still felt, however, that the instrument has much to offer in that the investigation of satisfaction of characteristics external to the direct teacher-student interaction may still have an effect upon this relationship (e.g. teachers may find it hard to isolate economic concerns at home associated with low pay from their levels of enthusiasm in the class). Additionally, if satisfaction with external characteristics is found to be associated with student outcomes, they provide a practical approach in which improvements in these outcomes can be made.

Furthermore, satisfaction is often viewed as the dependent variable in a student achievement–teacher satisfaction relationship. When analysing this relationship, the direction of the relationship is hard to determine and, arguably, one could equally determine the other (e.g. teachers' satisfaction may influence student achievement but that student achievement may also affect teacher satisfaction). The direction of the relationship is clearer when external factors are reviewed, however. For example, if satisfaction with pay is related to student achievement it would be easier to argue that satisfaction causes improved achievement than the reverse, i.e. that good student achievement influence teacher satisfaction with remuneration.

5.1.3. Student achievement

Ideally, the use of a Chilean standardised achievement test for the appropriate age group was envisaged. The obvious choice was the SIMCE examinations but unfortunately the

examination for this age group did not yet contain an evaluation of the science subjects and no other national or regional examination system exists before the PAA examinations. A review of the Chilean literature failed to locate other appropriate tests.

A pool of test items was created, therefore, from two alternative versions of a partially developed test instrument produced previously by a Chilean research team (Himmel, 1998). The items had been written by individuals within the university educational department of the Catholic University of Chile, Santiago (*Pontifica Universidad Católica de Chile)* in consultation with secondary school science teachers, a fact that makes the validity of the instrument more appropriate than more established achievement instruments obtainable from the international literature.

5.1.3.1.Content

The test items covered the core curriculum (Decree 300) for the first and second years of secondary education. It was multiple choice in format, a selection based on the size of the sample that required processing. The test was made up of 45 items, 15 questions from each science subject with four possible answers per item. According to classifications made by Bloom (1956) items tested general recall and simple application of knowledge.

The difficulty in constructing multiple choice examinations that qualitatively test higher skill functions in the student and the discrimination of such tests against female respondents, needs to be considered (Gipps & Murphy, 1994).

Although variation that is unrelated to achievement may be introduced by the individual's predisposition to guessing, it has been concluded elsewhere that guessing is affected more by the candidate's personality type, than by efforts to reduce this through instructions that threaten a penalty if guessing is attempted. Although guessing may be a problem when tests are high speeded, or when only very limited choices are provided, it is further concluded that when the student is given ample time to complete the test and 4-5 choices are provided, guessing does not contribute in any significant degree to falsely improving the candidate's score (Thorndike & Hagen, 1977). As this was the situation in the achievement instrument used here, no adjustment for guessing has been made. Students were asked to try not to guess but no penalty was associated with having done so. Students took between 60 and 90 minutes to complete the test.

The instructions that accompanied the test and a sample question were read with the students before the examination began and any doubts expressed by the candidates addressed.

5.1.3.2.Development

Items were selected from the pool based on the following criteria, some as recommended by reviews of multiple choice test construction (Thorndike & Hagen, 1971; Satterly, 1989):

- Questions that could be classified as a simple application of knowledge rather than simple factual recall were selected in preference although this was not always possible bearing in mind the limited number of items available in the pool.
- Questions where either the question stem or the answers were ambiguous or misleading, were adjusted or removed (e.g. ambiguous qualifying words such as *sometimes, nearly, always* were deleted). The use of negative statements were also excluded.
- Alternative answers were kept as brief as possible, keeping the majority of the information in the stem of the question. Although there was a continued feeling that some items were in need of refinement, there was concern at altering the items too drastically out of fear of compromising the contextual validity of the test.
- Correct answers were randomly allocated to the four letter groups to avoid the formation of any obvious pattern in correct answers. Such pattern formation may distract students in the responses they make.
- Inadvertent clues in the stem to the correct answer (e.g. grammatical consistency, repetition of words in stem and answer, obviously long alternatives) were also guarded against.
- The content of items within one science subject area that overlapped with the other two subject areas were avoided so as to try and confine knowledge to the individual teacher alone as much as possible, e.g. questions on pollution that may have been covered by both the Chemistry and Biology teacher were omitted.

It became evident from consultation with science teachers during previous instrument application that the lack of an external evaluation in the secondary school, until the university entrance examination, led teachers to be less constrained in the order in

which the respective curriculum is taught. Some teachers would alter the order within a single year whereas others would restructure the curriculum for both years, although this seemed less common. An extreme case showed a school that had abandoned Physics entirely for the year replacing it with Mathematics, presumably to do the reverse the following year. This heterogeneity does not stop at the order of the curriculum but also in the actual content and depth with which it is taught (Gysling, 1992b). This creates almost insurmountable problems for a researcher attempting to create a fair achievement test containing items that all students have actually been taught and preferably by the teacher with whom they are now in contact. Under optimum conditions, teachers could have been asked to comment on the extent to which students had covered particular topics, (Comber & Keeves, 1973) but time constraints made this impossible.

To try and combat this problem, items were selected that were largely present in the first year of secondary school and/or more foundation in their nature that would have been presumably taught by most teachers before progressing to more advanced topics in the second year. Fortunately the timing of the questionnaire (applied in the last months of the academic year lead to greater confidence that the students would have actually been taught most of the two-year curriculum).

Two versions of the achievement instrument were prepared with alternative questions being presented so as to identify items that were too easy, difficult or ambiguous to students in the pilot application.

The two instruments were applied to 46 students in the pilot school. The items of the pilot were reviewed and the facility indices (F.I.) of each item calculated. A selection of items, that fell in the 0.2 to 0.8 F.I. range, with as balanced a range of facility as possible, were selected for the final study. An equilibrium between the mean facility indices of the three subjects was also attempted. The test was ordered in the final instrument so that questions were grouped together by theme and by subject in order to facilitate answering. Where possible, the easier questions were placed first to try and inspire some initial confidence in the student. The facility indices were recalculated from the final data and are presented in Table 5.06.

Table 5.06: Facility indices for each achievement item

Item number	Biology	Physics	Chemistry
Item 1	43.0	86.2	81.1
Item 2	74.2	80.5	55.7
Item 3	29.0	48.5	57.5
Item 4	17.9	60.8	62.3
Item 5	21.9	14.9	64.9
Item 6	71.5	19.5	65.3
Item 7	32.8	12.7	59.2
Item 8	49.1	36.4	50.8
Item 9	52.2	42.6	41.9
Item 10	27.8	28.8	24.1
Item 11	55.5	24.0	16.8
Item 12	28.1	43.0	27.9
Item 13	52.2	7.0	32.0
Item 14	47.1	16.2	17.5
Item 15	17.5	39.2	36.8
Mean	41.3	34.2	39.7
Standard deviation	18.1	18.3	18.1

Analysis of variance showed there to be no significant differences between the mean facility indices of the three subjects (F=0.6), making a comparison between them more valid.

The opportunity did not arise for a retest version of the final instrument to be carried out but a split half reliability was calculated. With this purpose, the final test items were divided into two halves. It was attempted to make these two half tests as equivalent as possible and the division was based on their content and facility. Items were thus distributed so that equal numbers of items of each subject existed in each half test and that items of similar facility index were evenly distributed between the two tests. The Spearman-Brown coefficient was subsequently calculated and found to be an acceptable 0.7.

Criticisms of the instrument described have already been made in term of its capacity to test what students have actually been taught, its format and the disadvantages associated with these. As the achievement test was recognised as being limited in its accuracy, term marks were also collected during instrument application. This was done on the assumption that teachers have an intimate knowledge of what their students have learnt. Numerous factors subject these figures to criticism, however, with the heterogeneity in teacher evaluation criteria being one of the greatest threats to the reliability of this source of achievement data (Freedman, 1997). It is hoped, by viewing the achievement test and term mark data in parallel, both submitting to criticism, that a more accurate

overview of the situation will be created. The English and Spanish versions of the achievement test can be viewed in Appendix 7 and 8.

5.1.4. Student ability

One of the drawbacks of the present research is the lack of initial achievement data. The usual options in obtaining such data is either the collection of entrance examination results from the relevant schools or the use of earlier national or regional examination results from a previous educational level. Neither of these options was available to this study. Firstly, entrance examinations in all schools were conducted only in Spanish language and Mathematics. Secondly, previous examinations results (SIMCE for grade 8 of primary education being the examination of choice) were not available either for the individual student (reports were made based on school averages) or for all schools participating in the study (SIMCE examinations are very much in their infancy and are applied to a sample of schools per region only).

To compensate to some degree for the lack of entrance achievement data, a measure of observation and clear thinking was employed to gain an indication of the natural ability of the student. This cannot fully compensate for the lack of entrance achievement, as many factors other than ability will also affect a student's prior performance. The test used was Raven's Standard Progressive Matrices (Raven, 1960).

This is not a test of general intelligence by itself but correlates (r=0.86) with one of the more commonly used individual intelligence tests, the Terman-Merill. The retest reliability of the instrument varies between 0.83 and 0.93 (Raven, 1960).

Sixty items are answered and these are classed into 5 scales. Each scale in the test represents a system of thought, each item becoming progressively harder. The items are based upon graphic images only and were selected largely on the basis that this avoids translation and limits cultural reinterpretation, although it cannot be assumed to be truly context independent (Kline, 1993). This test is used by psychologists in Chile using Argentinean based norms against which student results in this research were compared.

As it has been found that the ability to think clearly varies with the individual's health and improves with practice, the test was used as an untimed capacity test, as one is not

measuring the speed of accurate thought work but the clarity thereof. Most students completed the test within a 60 minute time period.

A translation of Ravens' initial instructions was made and administered verbally to students completing the test. This, and standard procedures of supervision, were consistently applied when the test was administered across the sample population.

Disadvantages of the test for application in this work should be kept in mind namely, its inability to differentiate maximally between individual persons, especially at the extremes of the ability spectrum and the fact that it uses only items of one kind, that would favour students specifically good at this type of task (Kline, 1993).

5.1.5. Student socio-economic status

Socio-economic status is considered an important factor influencing student achievement (e.g., Comber & Keeves, 1973; Coleman, 1990) and attitude to science (James & Pafford, 1973). Although it is less dominant in its influence in a developing country (Heyneman & Loxley , 1983; Saha, 1983) socio-economic status is still a highly relevant variable that must be measured in the study.

The Ministry of Education of Chile uses the monthly fee paid by parents to the school and parental education as student socio-economic indicators (Ministerio de Educación, 1992) and these were included in the socio-economic status assessment instrument used in this thesis (English and Spanish versions can be viewed in Appendix 9 and Appendix 10 respectively). Other educational research (Zúñiga Fuentes, 1997) in the region also included as an indicator measure the income per student family member. The latter was calculated by dividing the total family income by the total number of people living in the home.

Collection of socio-economic status data was not without difficulty. Alternative interpretations of questions addressing the amount of earnings may be made and, although confidentiality was assured, is open to mistrust by the respondent. The parent may have been concerned about who would read the questionnaire, for example, and tempted to increase or decrease actual salary according to what the purpose of the questionnaire was suspected to be. The definition of the total number of members of the home also varied, issues of uncertainty arising when single parent families responded

and quoted the salary of an absent and possibly non-contributory parent. The monthly school fee, associated with the administration type of the school, and the education of the parent were considered, therefore, the more reliable indicators of socio-economic status in this study.

The instrument was administered to parents either through teacher-parent meetings or via the students involved in the study.

There is more to student family background than the indicators of socio-economic status is a final limitation. Coleman (1997) describes a student's family background in terms of human (e.g., parental education), financial (e.g., earnings and associated materials and nutrition) and social (e.g., quantity of quality interaction between student and parent) capital which, if present simultaneously, may maximise student achievement. No measure of social capital was made in this thesis, however, and, therefore, conclusions must be restricted to the narrow realm of socio-economic status of the student alone.

5.2. Sampling

Secondary school science was chosen in particular in this research as, at the time of study, the *MECE Media* reforms were in the process of implementation making this sector of education particularly relevant. It was also felt that students would be more likely to have better formed attitudes and beliefs by this age and be more capable of expressing them effectively. Specialist subject teachers were also available for study at this level.

The student and teacher samples were drawn from schools in the Province of Elqui of the IV region of Chile specifically from the urban zones of La Serena and Coquimbo.

Attempts were made, when sampling, to keep as many as possible of the variables, that could not be measured, constant.

The neglect and poor quality of rural education (Aedo-Richmond & Richmond, 1996) has been noted and, therefore, only urban schools were selected, so as to keep constant variables associated with the geographical location of the school. Schools were also selected for the study on the basis of them offering the second year of the first cycle of

secondary school of the *Humanistico Cientifica* type education, hence keeping age (to a degree as repeating students may affect this) and curriculum type consistent. This level was selected as all students are studying science to the same extent at this stage. Students in the second cycle of secondary education may be covering science to greater or lesser degrees based on their choice of electives. If these students had been selected, whether from those taking the science electives or not, a bias in their attitudes towards science, would have been introduced.

Establishments were government subsidised, either municipal or private in their administration. Private fee-paying schools were not included in the investigation as the difference between this educational reality and that of the subsidised sector was considered to be too large.

The population of schools that met with these stratification requirements was approached and, with the exception of one private subsidised establishment, access was gained to all schools. Eighteen schools, of a possible 19, were thus involved in the study. One of these schools was used for a pilot study leaving 17 schools in the final sample.

The sciences were treated as separate subjects in the Chilean curriculum and, therefore, student attitude, achievement and teacher scores in the present research were calculated accordingly. This subject division was made also on the assumption that each subject teacher/classroom is exposed to and is part of a distinct culture framed by the discipline under instruction. As science teachers are seen fit to be studied as a separate and distinct class culture from those of the Arts or Humanities classroom, so to is there the possibility that the three science subject teachers are sufficiently distinct to be considered subcultures within the wider frame of the science discipline. Furthermore, as student achievement data was based on three different sets of questions, this separate analysis by subject was necessary when teacher and student data were converged and related in later analyses. These factors precluded an amalgamation of the data into a single science sample.

5.2.1. Student sample

The student sample, at the end of the academic year under study, had a mean age of 15.4 years and would be completing their second year of the first cycle of secondary

education. For reasons of school management, an opportunistic sample of one whole class of students was chosen per school instead of a randomly selected group, as might have been ideally desired. All students attended Biology, Physics and Chemistry classes. Schools were asked to make available a class that was of average ability, although, despite school reassurance that this was being provided, there was some concern that higher ability groups were being presented, so as to portray the school in a better light. Controlling for ability may have counteracted this problem to some degree. A total sample of 625 students was thus selected. When open-ended questions in the analysis were addressed, a reduced sample of 70 questionnaires was randomly drawn from each school in the main sample, representing between 10 and 11 % of the students from each institution.

5.2.2. Teacher sample

The teachers selected for study were those who taught either Physics, Biology or Chemistry to the student sample. Each teacher was responsible for the entire year course. In the vast majority, 3 teachers were presented per school. In some instances, however, a teacher taught 2 of the sciences and in another, all three. One teacher taught in two of the schools under study. A total sample of 47 teachers was thus selected.

5.3. Response rates

The responses received per instrument of the total teacher and student samples is presented in Table 5.07.

Table 5.07: Instrument response rates

Instrument	Total number of individuals to whom questionnaire was administered	Number of individuals responding	Percentage response (%)
Teacher questionnaire	47	45	96
Student attitude questionnaire	625	554	89
Ability Instrument	625	530	85
Parent Questionnaire	625	415	66

Response rates were considered to be good although ideally a greater response from parents was desired.

A comparison between sample statistics and that of national and regional figures can be seen in Appendix 11.

5.4. Management issues

A minimum of four visits were made to each school. In the first visit, the project was explained to the head teacher or the teacher in charge of teaching methods and the curriculum (*Unidad Tecnica pedagogica-UTP)* and dates were set for the attitude, achievement and ability tests. Questionnaires for parents were given to these teachers to administer to parents. Teacher questionnaires were presented directly to the science teachers where possible, in an attempt to improve understanding and response to the instrument through more personal contact.

A gap of 2 or 3 months lapsed between the first application of teacher and student attitude/ability tests on the one hand and the application of the achievement test and term mark collection on the other. Although this break was unplanned, it was fortuitous in that a measure of teachers' attitudes precedes term mark allocation and achievement test performance, that may be under their influence.

This gap also enabled a preliminary report to be complied on the initial findings of the research, which was distributed to schools, informing them of the preliminary results of the research that had taken place in their establishment. This successfully ensured the continued forbearance of the schools, bearing in mind the amount of disruption the application of the 4 instruments must have caused.

5.5. Ethical issues

The subjects of the research (students and teachers) have the right to be informed of the research aims and applications. The rationale of the research was, therefore, explained to both parties and feedback given in the form of informal discussion and a formal preliminary report.

Confidentiality of all information, collected from both students and teachers, is also essential and was maintained. Expression of satisfaction with various aspects of the teaching job may be seen by some as a criticism of the educational establishment in which the research takes place. Teachers in private but state subsidised schools are particularly vulnerable to contract closure and, therefore, confidentiality is particularly important in these contexts. This issue was one of obvious concern to some teachers. The researcher met with some resistance in a particular private subsidised school due to

worries pertaining to the destination of the questionnaires and whether directors of the school would have access to the information. Although this was overcome and teachers reassured, it is wondered if teachers in other institutions had similar worries. It is also of concern when assessing the validity of the instrument that teachers may not have been entirely honest in their reports of satisfaction based on such fears. These issues have been raised elsewhere in the Chilean literature (Delano *et al.*, 1991).

To a degree, the foreign status of the researcher helped in the assurance of confidentiality. Contrary to initial expectation that an outsider would be viewed with distrust, foreign status was associated both by teachers, authorities and students more as a novelty than a threat and in many cases it was felt that access to schools, the ministry and regional authorities was acquired more easily and on better terms than if the researcher had been local. It was also felt that teachers were more assured that questionnaires would be confidential and not shown to directors, or any other authorities, again because of this external status of the researcher.

Students were asked for their attitude concerning their teacher. This information is of a sensitive nature which has the potential to affect the student /teacher relationship. Once again this information was kept strictly confidential and, in addition, students were asked in the pilot to express their concerns in answering such sensitive type questions. A resistance to making any form of criticism of the teacher is a possibility, bearing in mind the traditional, disciplinary atmosphere still present in some Chilean classrooms.

Teachers in Chile are poorly paid and are required, therefore, to work extremely long hours often in more than one institution. Additional demands have been made on their time as a result of the many new, including curricular, reforms that are being implemented in the region. For this reason, and a desire for impartiality, every attempt was made to keep the demands and influence of the research and opinions of the researcher to a minimum.

5.6. Discussion of Methodology

Attempts to discuss disadvantages in the research design have been made whilst outlining the methods used in each section of the study. A final concern that remains to be mentioned is the cross sectional nature of the study. The study, although completed over the majority of the academic year, can still only reflect teacher satisfaction and

student outcomes during a very limited period. Teacher satisfaction may change over time and vary from one part of the year to the other depending on the pressures imposed. A teacher, for example, may express dissatisfaction with workload when reports are due but be fully content with this dimension of work when having just returned from the summer break.

Student achievement and attitude may change through the year also (e.g., Wick &Yager, 1966). Furthermore, although on average teachers had taught students in the sample for on average a two year period, student outcomes have been influenced over a much longer time span than is catered for by this study and by many more factors than the teacher alone. A longitudinal study that measures *change* in student achievement and attitude along side the relevant teacher's satisfaction may be a more fruitful means of investigating the relationship at hand. In defence of the present design, however, it is hoped that it will provide preliminary indications of where relationships may lie that may justify the time and financial expenditure that future greater scale and longitudinal research would require.

This chapter has outlined the research design and methods employed in the investigation of the research questions described in Chapter 4. Limitations in the design have also been described so that the results that are presented can be perceived in context and in the light of an initial exploration into the relationships at hand. The Chapter that follows lays out the interrelationships between background variables, a process which initiates an understanding of the associations that exist between teacher job satisfaction and student outcomes.

CHAPTER 6 BACKGROUND CHARATERISTICS RELATED TO STUDENT AND TEACHER DATA

The aim of this chapter is to present the relationships between background characteristics (Relationship A; Figure 4.03; Chapter 4) and between background characteristics on the one hand and student achievement, perceptions, attitudes (Relationships D, Figure 4.03; Chapter 4), teacher overall job satisfaction (Relationship C; Figure 4.03; Chapter 4) and individual job components (Relationship B; Figure 4.03; Chapter 4) on the other. Relationships between the different student attitudes are investigated as is the disparity between term and independent achievement test scores. A review of the interactions described situates the teacher and student samples contextually and, hence, facilitates the interpretation of findings outlined in later chapters. It also provides pointers to which background characteristics need to be controlled in future analyses.

6.1. Relationships between background characteristics

6.1.1. Relationships between student and school characteristics

A full outline of the descriptive statistics of teacher, school and student background characteristics is presented in Appendix 11 (Section A11.1, A11.2 and A11.3). A comparison is made with national and regional statistics where appropriate, in order to develop an idea of the representativeness of the sample drawn.

There is an indication that several of the background characteristics are interrelated. An analysis of all possible interactions was completed but only those found to be significant are reported in this chapter, full coverage of all relationships investigated being observed in Appendix 12 (Section A12.1).

The relationship between the various indicators of socio-economic status of the student and the administration type of the school was one of the significant interactions calculated. A cross tabulation and associated Chi squared test[3] of parental education by school administration is presented in Tables 6.01 and 6.02.

[3] Where cell numbers fell below 5 and a 2 X 2 cross tabulation was at hand, the more robust Fisher prediction of significance was used rather than the Pearson prediction.

Income per family member and school fees paid per month, were also analysed by school administration but by way of independent t-tests (Table 6.03 and 6.04).

Table 6.01: Distribution of student sample by father's education and administration of school

	Level of education	**Group 1**	**Group 2**	**Group 3**	**Total**
School Administration	*Municipal*	32	35	71	*138*
	Subsidised	149	75	36	*260*
Total		*181*	*110*	*107*	*398*
Pearson's Chi squared	70.9*** (d.f.=2)				

Table 6.02: Distribution of student sample by mother's education and administration of school

	Level of education	**Group 1**	**Group 2**	**Group 3**	**Total**
School administration	Municipal	22	44	75	*141*
	Subsidised	119	92	63	*274*
		141	*136*	*138*	*415*
Pearson's Chi squared	46.9*** (d.f.=2)				

Table 6.03: Relationships between income per student family member and school administration

Variable	**t-test**
School administration (subsidised)[4]/income per student family member	9.6*** (d.f.=302.8)

It was initially supposed that a bias in socio-economic status would also be revealed when considering the two urban locations under investigation, namely La Serena and Coquimbo, external impressions being that La Serena was the more affluent area. Similar cross tabulations and Chi squared tests and t-tests were conducted, therefore, of location by the various socio-economic status indicators measured. With respect to parental education, relationships with location were not significant. Neither were relationships with income per student family member. The school fee paid to the school, however, *was* related to the location of the school (Table 6.04).

[4] The category entered first into the t-test analyses is presented in brackets after the variable name, in this and all future t tests presented. A positive t statistic indicates that this category showed the highest mean value, the least mean value, if the t value is negative.

Table 6.04: Relationship between school fees, school location and administration.

Variable	t test
Location (Coquimbo)/school fees*	-6.1*** (d.f.=466.0)
School administration (subsidised)/school fees*	30.4*** (d.f.=489.1)

*Uncategorised continuous data on school fees were utilised as Chi squared analysis of categorised data lead to several cells remaining empty.

From the evidence presented, therefore, (Tables 6.01-6.04) students from lower socio-economic status backgrounds are more likely to attend a municipal school and those from higher groups to be attending subsidised schools, findings in agreement with other Chilean studies (Himmel Koning *et al.*, 1993). Contrary to expectation, the only indication that the socio-economic status of students in Coquimbo might be lower came from the observation that school fees in Coquimbo were on average significantly less than those in La Serena.

Further interaction between background characteristics involved an analysis of the student ability variable. Tables 6.05 and 6.06 present the findings of such an analysis.

Table 6.05: Relationships between student ability, parental education and school fees paid per month

Variable	One way ANOVA[5] (F value)
Ability/father's education	17.3*** (d.f.=363); A significant difference in group means lies between education group 1 and 3 (4.7***) and education groups 2 and 3 (3.2***) [6]
Ability/mother's education	13.6*** (d.f.=380); A significant difference in group means lies between education group 1 and 2 (2.3*) and education group 1 and 3 (4.1***)
Ability/School fee	45.5*** (d.f.=529); A significant difference in group means lies between fee group 1 and 3 (4.4***) and fee group 2 and 3 (5.3***)

Table 6.06: Relationships between student ability, school administration type and student family income per member

Student variable	t-test/correlation
Ability/administration (subsidised)	t=8.8*** (d.f.=313.6)
Ability/income per student family member	r=0.2*** (d.f.=302)

[5] Scheffe post hoc analysis was employed in this and all subsequent ANOVA analyses

[6] In all ANOVA analyses presented in this thesis, when describing differences betweeen group mean, the group of the greatest mean will be routinely presented first, e,g, a significant difference betweeen group 1 and 3 (4.7***) indicates that the mean of group 1 exceeds that of group 2 by 4.7 units

It would seem from the results displayed in Tables 6.05 and 6.06 that ability scores are associated with the socio-economic status indicators of income per student family member, parental education and school fees paid, in addition to the administration type of the school (the last which appears to be associated with students of lower socio-economic status). This is not to conclude that students of lower socio-economic status have intrinsically lower ability but that the lack of cultural capital (Bourdieu, 1997) associated with this status may inhibit performance in this test. Gysling (1992b) also mentions the lack of motivation among such students, which may be reflected in their ability tests if maximum effort with these has not been made.

6.1.2. Relationships between teacher, student and school characteristics

In addition to interactions between school and student characteristics, those involving teacher background characteristics are equally important in constructing an overall impression of the context in which the study is situated.

Chi squared tests indicated that differences exist between subject groups by gender, male teachers appearing to be more likely to teach Physics and female teachers more likely to teach Chemistry and Biology in this sample (Table 6.07), a trend seen across the country (Tables A11.10, A11.11 and A11.12; Appendix 11).

Table 6.07: Distribution of teacher sample by gender and subject taught

	Subject	**Chemistry**	**Physics**	**Biology**	**Total**
Gender	Male	3	10	4	*17*
	Female	14	5	13	*32*
Total		*17*	*15*	*17*	*49*
Pearson's Chi squared	9.9** (d.f.=2)				

Analysis of the subject taught by the teacher and the number of establishments in which they taught (Table 6.08) showed that a relationship between these two variables just missed significance. If, however, only Chemistry and Biology teachers were considered, a significant relationship developed, the cross tabulation (Table 6.09) indicating that Chemistry teachers tended to work in two or more establishments and Biology teachers in one. This may be an indication of a shortage in Chemistry teachers. It may alternatively be an indication that Chemistry teachers cannot obtain sufficient hours in one establishment alone, due to a lack of demand for the subject and need to work in several institutions to make this up. This lack of demand may arise if Biology

is the subject focused upon at this age group (a percentage of students may be expected to leave at this stage) (Gysling, 1992b) and it is possible that more hours are spent on Biology and less on Chemistry and Physics. This, however, is likely to differ from school to school.

Table 6.08: Distribution of teacher sample by number of establishments in which teacher works and by subject taught.

	Subject	Physics	Biology	Chemistry	Total
Number of schools in which work	*1*	8	13	5	*26*
	2	6	3	11	*20*
Total		*14*	*16*	*16*	*46*
Pearson's Chi squared	8.1 (d.f.=2)				

Table 6.09: Distribution of teacher sample by number of establishments in which teacher works and by subject taught (Chemistry and Biology alone).

	Subject	Chemistry	Biology	Total
Number of establishments in which they work	2 or more	11	4	*15*
	Only 1	5	11	*16*
		16	*15*	*31*
Pearson's Chi squared	5.5* (d.f.=2)			

Associations between teacher background characteristics and background variables, other than subject, are also possible and, although perhaps tangential to the study, may point to underlying trends that subsequent analysis can draw on to explain findings.

Gender differences between teacher characteristics (Tables 6.10 and 6.11) are not wide spread but it was shown that male teachers as a whole, especially male Biology teachers, tend to work more hours in one establishment than their female counterparts. Female Chemistry teachers work longer hours in total than their male colleagues and female teachers in general also occupy households of greater income per family member. With regard to the latter, female teachers may be better off economically as they are more likely to come from homes where their male partner is working also. Male teachers on the other hand may well be the sole wage earner.

Male Physics teachers were shown to demonstrate a tendency to teach students of higher income per family member (Table 6.10) and be teaching in schools where school fees are higher (Table 6.11).

Table 6.10: Relationships between teacher gender and other background characteristics (student t-tests).

Interaction	Total sample	Physics	Biology	Chemistry
Teacher gender (female)/hours working at present school	-2.5* (d.f.=27.9)	-	-3.9** (d.f.=10.8)	-
Teacher gender(female) /total hours worked	-	-	-	3.5** (d.f.=10.0)
Teacher gender (female)/income per student family member	-	-2.7* (d.f.=11.0)	-	-
Teacher gender(female)/income per teacher family member	2.7* (d.f.=34.0)	-	-	-

Table 6.11: Distribution of Physics teacher sample by teacher gender and school fees paid per month.

	Gender	Male	Female	Total
School fees paid	*1*	5	0	*5*
	2	3	1	*4*
	3	2	4	*6*
Total		*10*	*5*	*15*
Pearson's Chi squared	5.6 (d.f.=2)			
t-test⁺(female)	-2.6* (d.f.=12.7)			

⁺Low cell content led to the relationship being tested using a t-test and the non categorised school fee data

It might be thought that teaching students of higher socio-economic status would influence the levels of satisfaction of these male Physics teachers. Results will show (Table 6.39) that although no gender differences in Physics teacher job facet satisfaction are observed, male Physics teachers are better satisfied overall.

Although no underlying reasons for these gender differences could be put forward with information so far at hand, it would be interesting to speculate that female Physics teachers make more conscious effort to work with less privileged students or are discriminated against when they try and obtain positions in more affluent schools, i.e., if the school has a choice they prefer a male Physics teacher. On must consider the results with caution, however, bearing in mind the small numbers of male Biology and Chemistry teachers and female Physics teachers in the sample.

The remaining significant interactions between background characteristics are outlined in Tables 6.12 to 6.16.

Table 6.12: Relationships between teacher background characteristics and student or school characteristics (correlations)

Interaction	Total sample	Physics	Biology	Chemistry
Teacher age/experience	0.9*** (d.f.=42)	0.9*** (d.f.=14)	0.8*** (d.f.=17)	0.9*** (d.f.=15)
Teacher age /years at the establishment	0.7*** (d.f.=37)	0.8** (d.f.=13)	0.7*** (d.f.=14)	0.6* (d.f.=14)
Experience /years at the establishment	0.7*** (d.f.=40)	0.8** (d.f.=14)	0.9*** (d.f.=14)	0.6* (d.f.=16)
Years at establishment /total working hours	-	-	-	0.6* (d.f.=16)
Hours working in particular institution /total working hours	0.5** (d.f.=39)	-	-	0.6* (d.f.=16)
Hours working in particular institution /student ability	-♣	-	0.6* (d.f.=15)	-
Hours working in particular institution /income per teacher family member	-	-	-	0.7** (d.f.=14)
Total working hours /income per student family member	-♣	-	-	-0.6* (d.f.=14)

♣In this preliminary analysis, student class means were utilised when relating student and teacher variables. Analysis was not conducted where student class means would need to have been repeated in triplicate to make an analysis of the total sample possible

Table 6.13: Relationships between teacher background characteristics and student or school characteristics (t tests and ANOVA)

	Total sample	Physics	Biology	Chemistry
Teacher age /location of school (Coquimbo)	-2.0* (d.f.=33.9)	-	-	-
Years of service/Number of schools in which she works (in one establishment alone)	2.2* (d.f.=36.8)	-	-	-
Hours working in particular institution /Number of schools in which she works (one institution alone)	2.7* (d.f.=27.5)	-	-	4.9*** (d.f.=12.6)
Total working hours /administration (subsidised)	-2.7* (d.f.=28.9)	-	-	-3.1* (d.f.=10.7)
Total working hours /Number of schools in which she works (one institution alone)	-	-3.4** (d.f.=9.9)	-	-
Total working hours /School fees paid per month♣	F=3.5* (d.f.=39) A significant difference in group means lies between fee group 1 and 3 (-9.8*)	-	-	-
Number of schools in which she works (in one institution alone /income per student family member	-	-	2.2* (d.f.=12)	-

♣All results represent the results of a t-test unless an F ratio is quoted in which case a one way ANOVA has been utilised.

Table 6.14: Distribution of total teacher sample by number of schools in which teacher works and the location of the school.

	Number of schools in which teacher works	1	2 or more	Total
Location of school	Coquimbo	5	8	*13*
	La Serena	21	8	*29*
Total		*26*	*16*	*42*
Pearson's Chi squared	4.4* (d.f.=1)			

Table 6.15: Distribution of Physics teacher sample by number of schools in which teacher works and the school fees paid per month/

	Number of schools in which teacher works	1	2 or more	Total
School fees paid	1	4	0	*4*
	2	3	1	*4*
	3	1	5	*6*
Total		*8*	*6*	*14*
Pearson's Chi squared	7.5* (d.f.=2)			
t-test (1 institution) ♣	3.3** (d.f.=11.20)			

♣ School fee data can be categorised into non continuous type data (where cross tabulation would be necessary for this analysis) or left as an continuous type variable, where a t-test is applicable. Results of both analyses have been reported here.

Table 6.16: Distribution of Biology teacher sample by number of schools in which teacher works and the school fees paid per month

	Number of schools in which teacher works	1	2 or more	Total
School fees paid	*1*	5	0	*5*
	2	2	0	*2*
	3	4	4	*8*
Total		*11*	*4*	*15*
Pearson's Chi squared	4.8 (d.f.=2)			
t-test (1 institution)	3.4** (d.f.=12.3)			

A review of Table 6.12 showed as expected that teacher age and teaching experience and years of service at a particular school are related. It was also found that overall, teachers in La Serena tend to be older (Table 6.13).

There is some indication that the longer teachers have been at one particular school the more likely they are to have acquired a greater number of working hours in their timetable (in the case of Chemistry teachers) and be working at only one institution (in

the general teacher sample) (Table 6.12). This may demonstrate that teachers more established in a school for a longer period have managed to create a more stable career for themselves with sufficient working hours in a single institution. This is a situation one would imagine is more desirable than the disruption of the alternative of working in 2 or more institutions in an attempt to increase one's hours to an adequate level (Table 6.13).

One must take into account the probability that some of the relationships found may arise by chance alone. One such example may be the relationship found between student ability and the number of hours the Biology teacher works in the particular school where it is difficult to find a direct rationale to explain such a relationship. Some relations, however, are self-evident. A greater number of hours spent in one institution, for example, is related to the total number of hours that teachers work (Table 6.12) and the fact that teachers who work in one school alone score highly in the 'hours spent in school where the questionnaire was applied' category (Table 6.13). Others are less easily explained, e.g. Chemistry teachers who are financially better off have longer hours in the school where the questionnaire was applied. As many teachers are paid by the hour and do not have full contracts, the higher income may be related to being able to work longer hours but the appropriateness of this suggestion pales if the lack of association between total working hours and income are considered. Alternatively this may be an indication that teachers working mostly in one institution are benefiting financially, perhaps because they are more likely to have negotiated a full time, better paid contract.

Teachers in municipal schools work longer hours in general, a fact reiterated in the Chemistry teacher sample (Table 6.13). In the Physics teacher sample, those teachers working in more than one institution appeared to be working longer hours but no relationship was found in the general sample or in other subjects. Teachers generally in the group of schools paying the least fees also work longer hours than those in the higher fee paying group. (Table 6.13) and Chemistry teachers who taught lower socio-economic status students (as reflected by lower income per student family member) also work longer hours (Table 6.12). The trend would seem to be, therefore, that teachers working in the poorer socio-economic status municipal schools are working for longer each week, a fact that may have an impact on their job satisfaction. It would be

interesting in further research to determine how this trend related to the supply and possible shortage of science teachers prepared to work in these environments.

Further findings show that teachers from La Serena tended to work in one school as opposed to those in Coquimbo (Table 6.14) and that Physics and Biology teachers who worked in one school only, tended to work in those schools where fees paid were higher (Tables 6.15 and 6.16). Among Biology teachers (Table 6.13) a further indicator of student socio-economic status (income per student family income) was also shown to be related to the number of schools in which a teacher worked; those working in only one institution generally teaching students of higher socio-economic status. This is further confirmation of a general image that appears to be emerging of perhaps slightly younger teachers working in several institutions, for longer hours in Coquimbo, often in schools of lower socio-economic status catchment, municipal in administration. These conditions are likely to promote feelings of dissatisfaction and less stability in the job. This is in contrast to a group of older teachers, more likely to be working in La Serena in one institution with more reasonable working hours. A cluster analysis of these variables in future research would assist in the development of such profiles.

So far an image based on background characteristics has been created of the nature of the samples that were analysed. The effect of the above characteristics upon the two student outcomes of attitude and achievement will now be addressed.

6.2. Relationships between student attitude and belief scales and background characteristics

It would seem from a preliminary review of descriptive statistics of the attitude data (Section 11.4; Appendix 11) that students hold more positive attitudes and beliefs towards the subject of Biology than the other two sciences. This supposition was tested by comparing the different subjects using a one way ANOVA accompanied by Scheffe post hoc analysis (Table 6.17).

Table 6.17: Comparison between subject attitude and belief scales

Variable[+]	**One way ANOVA**
Attitude to class	F=50.7***
A significant mean difference lies between the attitude to the	**Mean difference between groups**
Biology class/Chemistry class[♦]	0.3***
Chemistry class/ Physics class	0.2**
Biology class/ Physics class	0.5***
Attitude to teacher	F=20.7***
A significant mean difference lies between the attitude to the	**Mean difference between groups**
Biology teacher/ Chemistry teacher	0.3***
Chemistry teacher/Physics teacher	0.0
Biology teacher/Physics teacher	0.3***
Perceptions of teacher job satisfaction	F=13.6***
A significant mean difference lies between:	**Mean difference between groups**
Perception of Biology teacher/Perception of Chemistry teacher	0.2***
Perception of Chemistry teacher/ Perception of Physics teacher	0.0
Perception of Biology teacher/ Perception of Physics teacher	0.2***

[+]Note that a comparison with attitude to science as a career is not analysed as this scale is a general scale to science and, hence, cannot be divided into three separate subject forms

[♦]Variable presented first represents that with the higher mean.

These results confirm that students consistently report themselves to have better attitudes toward the subject of Biology and their Biology teacher than towards Chemistry and Physics. Students also perceive their Biology teachers to be better satisfied. In a comparison of the remaining two sciences, Chemistry classes are favoured above those of Physics but no difference appears to lie between the attitudes about these teachers or beliefs concerning their satisfaction. Better attitudes to Biology classes may originate from the greater applicability of Biology to the everyday lives of the student (in terms of health, reproduction, for example) and this attitude to the subject may transfer into a predisposition to liking the teacher and perhaps even to perceiving them as happier. The attitude and belief scales presented are seen to vary as a result of other background variables other than the subject, as investigation of the relationships with other school, student and teacher background variables show (Table 6.18-6.21[7]). With respect to the teacher variables, the class mean for each attitude or belief scale (and later on achievement) was utilised in analysis. Depending on the nature of the variable, correlation, t-test or ANOVA (with Scheffe post hoc) analyses were conducted. The attitude of students to science as a career were unrelated to any teacher, school and student variables other than student gender (Table 6.18).

[7] A full presentation of significant and non significant results can be viewed in Section A12.2; Appendix 12.

Table 6.18: The association between student gender and attitude to science as a career.

Dependent variable	Independent background variable	t-test (t)
	Student gender (female)	2.5* (d.f.=535.6)

Table 6.19: The association of student, school and teacher background characteristics with attitude to the class

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Attitude to Physics class	Location (Coquimbo)		-3.1** (d.f.=262.7)	
	School fee			3.2* (d.f. =550); Individual differences proved not to be significant by the Scheffe test. Alternatively, significant mean differences lie between group 1 and 3 (1.9) when analysed by the Tukey HSD post hoc analysis.
	Experience	0.59* (d.f.=15)		
	Teacher gender (female)		-2.6* (d.f.=8.9)	
Attitude to Biology class	Location (Coquimbo)		3.8 *** (d.f.=264.2)	
	Student gender (female)		4.8*** (d.f.=543.8)	
	Income per student family member	0.1* (d.f.=306) (p=0.05)		
	School administration (subsidised)		2.6* (d.f.=427.6)	
Attitude to Chemistry class				
	Location (Coquimbo)		2.7** (d.f.=256.8)	
	Teacher gender (female)		3.0* (d.f.=14.6)	

Table 6.20: The association of student, school and teacher background characteristics with attitude to the teacher

Dependent variable	**Independent background variable**	**Correlation (r)**	**t-test (t)**	**ANOVA (F)**
Attitude to Physics teacher	Location (Coquimbo)		-4.4*** (d.f.=247.8)	
	School administration (subsidised)		-2.9** (d.f.=444.5)	
	School fee			29.7*** A significant difference in group means lies between groups 1 and 2 (3.8***) and between groups 2 and 3 (–0.3)
	Total hours worked by teacher	-0.6* (d.f.=13)		
Attitude to Biology teacher	Location (Coquimbo)		5.3*** (d.f.=318.4)	
	Mother's education			4.2* (d.f.=384) A significant difference in group means lies between groups 1 and 3 (1.5*)
	Income per student family member	0.1* (d.f.=302)		
	School administration (subsidised)		2.0* (d.f.=406.2)	
Attitude to Chemistry teacher	Student age	-0.1* (d.f.=542)		
	Student gender (female)		3.4** (d.f.=541.2)	

Table 6.21: The association of student, school and teacher background characteristics with the perception of the student of the teacher's satisfaction

Dependent variable	Independent background variable	Correlation (r)	t-test (t)	ANOVA (F)
Perception of Physics teacher satisfaction	Location (Coquimbo)		-3.8*** (d.f.=249.2)	
	School fee			3.3* (d.f.=539) A significant difference in group means lies between groups 1 and 3 (0.9*)
	Experience	0.6* (d.f.=15)		
Perception of Biology teacher satisfaction	Student age	-0.1* (d.f.=545)		
	Location (Coquimbo)		3.9*** (d.f.=246.7)	
	Mother's education			5.5** (d.f.=386) A significant difference in group means lies between groups 1 and 3 (1.2**)
	Income per student family member	0.2** (d.f.=304)		
	School administration (subsidised)		3.9*** (d.f.=246.7)	
	Ability	0.1** (d.f.=499)		
	School fee			10.1***(d.f.=549) A significant difference in group means lies between groups 1 and 3 (0.8*) and groups 2 and 3 (1.4***)
Perception of Chemistry teacher satisfaction	Student age	-0.1* (d.f.=541)		
	Student gender (female)		3.2** (d.f.=540.8)	
	School administration (subsidised)		3.7*** (d.f.=337.92)	
	Ability	0.1** (d.f.=496)		
	School fee			3.7* (d.f. =543). A significant difference in group means lies between groups 2 and 3 (0.9)

Although each of the remaining scales was associated with its own unique set of background variables (Tables 6.19-6.21), discussion will focus upon those where some form of commonality of influence between scales can be established. Some consistency across the attitude and belief scales suggests that these scales are related

6.2.1. Location of school

The location of the school, for example, appeared to be a key factor in the nature of all attitudes and beliefs formed by students, with the exception only of the attitude to the Chemistry teacher and the student perception of the satisfaction of this latter teacher.

In the attitude to class scale, students in La Serena demonstrated better attitudes to their Physics classes whereas those in Coquimbo report better attitudes in Biology and Chemistry classes. Students in La Serena also reported more favourable attitudes to their Physics teacher, students in Coquimbo showing better attitudes towards their Biology teachers. Similarly, Physics teachers are perceived as better satisfied in La Serena with similar findings for Biology in Coquimbo. It is hard to pin point why the differences in location may be arising but as school fees are shown to be significantly higher in La Serena, this might be associated with better resourcing.

The attendance of the highest school fee group of schools is associated with better student attitudes to Physics classes, the Physics teacher and the perception of the Physics teacher's satisfaction (Tables 6.20-6.21). Combining this with the fact that higher fee paying schools may be better resourced, leads to the evolution of the possible explanation that school resourcing (linked to fees) may lead to better classes and happier teachers, situations which influence students attitudes and beliefs in the subject. This may be supported by the argument that Physics teachers rely to a greater degree on more expensive physical resources and materials if compared to Biology and Chemistry where the subject can be taught more easily with the support of relatively cheap practical resources.

This explanation although perhaps useful in the explanation of the better attitudes and beliefs in Physics in the La Serena area, does not help explain why attitudes and beliefs in Biology and Chemistry are more positive in the Coquimbo region. A more detailed study looking specifically at the town differences could perhaps solve this dilemma.

6.2.2. School fees

Continuing with the theme of school fees, one finds that students attending the higher fee school groups perceive their teachers to be better satisfied in all three of the science subjects than those in lower fee paying groups. Interpretation of these findings hinges upon what the fee paid by the school is seen as representing. If viewed as an indicator of student socio-economic status, then it could be conjectured that, if student perceptions are correct, teachers who instruct students of lower socio-economic status are less satisfied, perhaps because of the problems associated with these groups such as low student motivation and discipline (Gysling, 1992b).

Alternatively, school fees may be an indicator also of the amount of funds available to the school for better resourcing, as described earlier, and it is assumed that teachers would be better satisfied with more resources at their disposal. Associated with this, parents who can afford to send their children to high fee paying schools may be of greater influence in the school and demand better resourcing.

In either instance, however, no relationships were found between school fee, or any other socio-economic status indicator, and actual teacher reports of job satisfaction (Section 6.6). This gives an initial sign that students may misinterpret teacher satisfaction, basing their answers on factors other than the teacher's true satisfaction.

6.2.3. Socio-economic status

Indicators of socio-economic status seemed of particular influence in Biology with income per student family member being relevant in all three student scales and mother's education of relevance in the attitude to teacher and perception scales. The influence of socio-economic status is in disagreement with opinions presented by Banu (1986) in other contexts who fail to find socio-economic status as a factor in the determination of attitude to science but in agreement with others (Gardner, 1975).

6.2.4. Administration

Biology and Chemistry teachers are perceived by students in subsidised schools as better satisfied than those in municipal schools. This raises question as to what in the private subsidised sector may actually lead to better satisfaction in these subject teachers or what it is in these establishments that leads students to perceive their teacher as better

satisfied. Salaries are considered better for one thing[8] as are working conditions in general, and students of higher socio-economic status and ability (or motivation) are being taught (Tables 6.01, 6.02, 6.03 and 6.04). Furthermore, teachers in general, and Chemistry teachers, in particular, work longer hours in municipal schools than do their subsidised colleagues (Table 6.13). It would be tempting at this early stage of analysis, therefore, to suppose that Biology and Chemistry teachers have reason to be better satisfied in subsidised schools and that students are able to perceive this to some degree.

School administration is also associated with student attitude to the teacher although in Physics, municipal students have better attitudes to the teacher, whereas students in subsidised schools have better attitudes to their Biology teachers and the subject of Biology itself. A more qualitative study would be required to explore reasons for these subject differences.

6.2.5. Ability

Although student ability did not appear to relate to attitude to the class or teacher in any of the subjects (in confirmation of the work of Steinkamp & Maehr, 1983), it was found interestingly to associate with students' *perceptions* of teacher satisfaction in Biology and Chemistry, with more able students viewing their teachers as better satisfied. Previous research has shown that ability may interact with attitude to science. Positive attitude to science decreases as students progress up the school but this occurs more dramatically in middle ability than in low or high ability students (Simpson & Oliver, 1990). Simpson & Oliver suggest that the latter groups may receive more attention than do middle ability students, which may explain why the latter develop poorer attitudes than do their peers. Although the findings presented in this thesis do not show attitude to be related to ability, the explanation may be partially transferred to the association between ability and the perception scales. It is conceivable that students of higher ability are favoured by teachers unconsciously and that better relations develop between them as a result. This may lead to these more able students perceiving teachers as more satisfied, as when in contact with these students, teachers are probably more content. The experience of lower ability students may be less positive.

[8] Although no significant difference in school administrations was found between the income per teacher family member variable, a significant difference was detected in the variable that involved the family income alone (t=2.4*; d.f.=27.2)

By showing that the very lowest ability groups also demonstrate better attitudes, Simpson & Oliver (1990) suggest that the relationship between ability and attitude is not a linear one (a fact assumed by the use of correlation analyses here). To test the possibility of a non-linear relationship in the present context, ability data was categorised into three groups (Table 6.22) and the attitude and belief scales reanalysed using a one way ANOVA (Table 6.23).

Table 6.22: Distributions of categorised student ability scores

Ability group	Score range	Percentage of student sample (%)
Group 1 (High)	53-60	26
Group 2 (Medium)	47-52	33
Group 3 (Low)	0-46	26
Missing		15

Table 6.23: Reanalysis of attitude and belief scales using new ability categories

Variable	One way ANOVA (F value)
Attitude to Biology class	0.1
Attitude to Biology teacher	0.4
Perception of Biology teacher satisfaction	4.9** A significant difference in group means lies between groups 1 and group 3 (1.1**)
Attitude to Chemistry class	0.5
Attitude to Chemistry teacher	4.9** A significant difference in group means lies between groups 2 and 1 (1.6**)
Perception of Chemistry teacher satisfaction	4.3* A significant difference in group means lies between groups 2 and 3 (1.1*)
Attitude to Physics class	0.6
Attitude to Physics teacher	0.3
Perception of Physics teacher satisfaction	0.4

This analysis confirms the relevance of ability to student perceptions of Biology and Chemistry teacher satisfaction. In Biology, a linear relationship was supported with the means of the low, middle and high ability groups being calculated as 4.0, 4.5 and 5.1 respectively, significant differences lying between the highest and lowest ability groups. This would continue to favour the explanation put forward that higher ability groups are likely to have teachers who are better satisfied and, hence, students report them to be so. It does not favour, however, the explanation that middle ability groups feel neglected. It could follow that the relationship between ability and student perceptions are a reflection of the quality of the student-teacher relationship but a lack of association between higher ability and attitude to the *teacher* does not support this thinking. If perceptions are more cognitively or less socially based, rather than influenced by attitudes and teacher-student interaction, this may mean that higher ability students are

more aware or better formulate perceptions of their teachers sentiments than do lower ability students (assuming they are correct of course). Qualitative data presented in Chapter 9 (Section 9.3), however, will show no difference between ability groups in the reasons for believing teachers are satisfied. This leaves the dilemma of finding a plausible explanation unresolved and further research is required to unravel these relationships between ability and perception.

The mean for each ability group on the Chemistry perception scale were 3.0, 4.1 and 3.9 for the low, middle and high ability groups respectively, significant mean differences being found between the low and middle groups. The greater favourability of the middle ability group was also noted in the attitude to the Chemistry teacher scale, a scale that did not feature in the correlation analyses. Means for this scale for the low, middle and high ability groups were 1.1, 2.2 and 0.6 respectively. Contrary to expectation that middle group students feel neglected, they seem in fact to perceive their teachers to be better satisfied and to have better relations with the teacher. Interpretation for Chemistry of the relationship between ability and student perceptions and attitude to teacher may be less straight forward than the more linear relationship observed in Biology. It would appear that in this situation more is at play than teachers being happier to work with brighter students. Some other factor appears to be counteracting the trend that higher ability students perceive their teachers as better satisfied such that middle group now perceive teachers to be happier. This data does not yield any further explanation nor does it provide insight into why the relationship between ability and student perceptions may differ in Chemistry and Biology subjects.

6.2.6. Teacher gender

Teacher gender appears to play a role in the development of a student's attitude to the class. This may be supposed from results showing that students taught by male Physics teachers and female Chemistry teachers had better attitudes to each subject (Table 6.19). It should be remembered however, that the distribution of teachers is by no means equal, with the majority of Chemistry teachers being female and the majority of Physics teachers being male (Table 6.07). This leads to the influence of teacher gender upon attitude best left as unresolved in this sample.

6.2.7. Student age

Inadequate age variation in the sample and the lack of normality of distribution (Section A11.1; Appendix 11), leads to some scepticism of the negative correlation of student age with attitude firstly towards Chemistry teachers and secondly with perceptions of Biology and Chemistry teacher satisfaction (Tables 6.20 and 6.21). If a relationship does exist, the older students (associated with students likely to be repeating or have repeated at some stage in their scholastic career) have a poorer attitude to their Chemistry teacher and perceive their Chemistry and Biology teachers to be less satisfied. This may be an indication that repeating students have a poorer relationship with their teacher than students who have not experienced such academic failure. Teachers may also find it harder to teach these students who are more likely to be experiencing learning difficulties, and this appears in the reports of students on their teachers and their teachers' job satisfaction.

6.2.8. Student gender

Of all the scales, the attitude to science as a career seemed the least influenced by student, school and teacher variables, student gender being the only variable of influence (Table 6.18). This scale is perhaps subject to many variables other than those discussed here, many of which are expected to be external to the school itself such as parental expectations and media influence. Female students showed a more positive attitude to science as a potential career than males.

Student gender was also shown to be associated with the attitude of students to Biology classes (Table 6.19), the Chemistry teacher (Table 6.20) and perceptions of the Chemistry teacher's satisfaction (Table 6.21), female students once again reporting more favourably than their male peers. These results cannot lead to the support of statements by Gardner (1975) and Schibeci (1984) that student gender difference is the most important and consistent of variables when considering attitudes towards science as only two of the six attitude scales in this study show this relationship to be poignant. Nor do the results favour the research that would lead to the belief that male students show better attitudes to science, especially in Physics (Walberg *et al.*, 1967; Simpson & Oliver, 1990; Steinkamp & Maher, 1983; Banu, 1986; Schibeci & Riley, 1986; Jones *et al.*, 2000). No gender bias is evident in the Physics analyses and female students show the more favourable attitude in all the scales where gender differences were located.

More positive attitudes of females in Biology and Chemistry do confirm reviews elsewhere, however (Gardner, 1975; Steinkamp & Maher; 1983; Schibeci, 1984). The disagreement with some of the research in the sixties, seventies and eighties is quite reassuring as it may indicate that the exclusion of girls from the sciences in terms of their perceptions of science as a potential career and as a subject has begun to break down. It was somewhat surprising, however, bearing in mind reports on continued gender discrimination within the Chilean classroom (Micheli & Edwards, 1995). The class and teacher scales do measure specific attitudes, however, and trends may not have altered to any great extent if other science related attitudes, beliefs about the nature of science or the experience of the different genders outside school, in terms of different science activities, are measured.

It was interesting to note that boys held poorer attitudes to their Chemistry teacher than did girls and it was wondered if this could be related to the fact that the majority of Chemistry teachers were female. Boys may still consider Chemistry to be a male preserve and have difficulty with it being taught by a female teacher. The fact that there was no gender difference in the attitude to the Biology teachers, where there is also a predomination of female teachers, may support this theory as boys may accept female instruction in this instance, Biology being seen as a more feminine area. Girls do not have the same problem with a predomination of male teachers in Physics and this suggests that it is not the fact that the student cannot identify with a teacher of the opposite gender but that it is the legitimacy of the teacher's gender that might be the issue at hand, i.e., girls can accept that male teachers will be teaching what society views as the more masculine of the sciences.

6.2.9. Other factors

The total number of hours Physics teachers work was negatively correlated with the attitude of students to this teacher (Table 6.20). One wonders, therefore, if greater working hours causes undue stress for these teachers that is transferred to the classroom, harming the relationship of students with the teacher. Teacher experience, on the other hand, was positively associated with the perceptions students have of the satisfaction of their Physics teachers (Table 6.21) and further hypotheses may suggest that experienced teachers are able to hide their discontentment or even have learned to overcome the conditions that might have caused these feelings in less experienced teachers.

It was noticed that student variables featured more amongst those that might have an influence upon attitude and belief scales than did teacher variables. This assumption is not a valid one, however, as the teacher variables are associated with student scales by means of averaging student scores into a class mean. This reduced the sample size in these analyses dramatically (from a maximum of 625 students to a maximum of 17 classes) and much greater criteria are required before significant relationships can be accepted at even the 5% level. In other words what might be a significant correlation, for example, when student or school variables are linked with scales in the larger student sample may fail to reach any level of significance when the teacher variables are associated with class means in the smaller sample of class means. The influence of student/school variables in comparison with teacher type variables cannot be fairly made in this instance, therefore. It should also be warned that the calculation of class means causes a loss of measurable variance at the student level of analysis.

6.3. Relationships between attitude scales

Considering that several of the attitude and belief scales are linked to similar background characteristics, it may be suggested that some of these scales are interrelated. A student's attitude to his class may be partially developed in response to the relationship he has with the teacher of that subject (or vice versa). Furthermore, it is possible that a student who has a better relationship with and attitude towards his teacher is more inclined to report his teacher as satisfied. Correlations between scales (Table 6.24) would support these suggestions.

Table 6.24: Correlations between attitude scales

Attitude scales	Subject	Correlation (r)
Attitude to subject/attitude to teacher	Physics	0.6*** (d.f.=545)
	Biology	0.6***(d.f.=543)
	Chemistry	0.6***(d.f.=541)
Attitude to subject/Attitude to career	Physics	0.3***(d.f.=535)
	Biology	0.5***(d.f.=534)
	Chemistry	0.4***(d.f.=534)
Attitude to subject / student perceptions of teacher job satisfaction	Physics	0.5***(d.f.=537)
	Biology	0.5***(d.f.=543)
	Chemistry	0.5***(d.f.=538)
Attitude to teacher/ student perceptions of teacher job satisfaction	Physics	0.6***(d.f.=536)
	Biology	0.5***(d.f.=543)
	Chemistry	0.6***(d.f.=537)
Attitude to teacher/Attitude to career	Physics	0.2***(d.f.=533)
	Biology	0.2***(d.f.=532)
	Chemistry	0.2***(d.f.=531)
Attitude to career/student perceptions of teacher job satisfaction	Physics	0.2***(d.f.=527)
	Biology	0.3***(d.f.=534)
	Chemistry	0.1**(d.f.=530)

Associations of similar background characteristics with both attitude and perception scales (Section 6.2) suggest that the attitude to class and teacher and perception of teacher satisfaction scales might be related. The moderate correlation between attitudes and perception scales (Table 6.24) confirms this. These positive correlations may indicate that there is a possibility that scales measuring attitude and beliefs/perceptions are such that students are unable to differentiate between their responses to the different scales. Students also may not have sufficiently developed attitudes to the individual constructs to answer in any but a similar vein in all three scales. The successful factor analysis of the individual items into four separate factors, however, would signal against such conclusions.

A third and preferred suggestion is that the scales are linked conceptually, i.e. that the attitude of students to the teacher may influence their feelings towards the subject (or vice versa) and that attitudes to the teacher and class may help develop a particular attitude to a potential career in science (and again vice versa). Additionally, students' attitude to the teacher and class (and to a lesser extent their attitude to a career) could contribute to the perceptions they hold of their teacher's job satisfaction, especially if opinions on teachers' satisfaction are not well developed prior to measurement of the scale.

The correlations between the attitude to career scale and the other three scales were consistently the lowest in all three subjects ranging from weak to moderate in strength.

This is not surprising as one would imagine, once again, that the influences upon attitudes to science as a career lie to a high degree outside the school environment and that student attitude to the class and teacher and the satisfaction they see science teachers presenting are only a few of the possible influences upon this attitude. A measurement of students' attitudes to *teaching* as a career rather than *science* may have been more related to the scales presented here.

6.4. Relationships between achievement scores and background variables

In a review of the descriptive statistics for independent test scores and term marks (Section A11.5; Appendix 11) there was some indication that students (in the independent test scores as well as in the school term marks) are achieving less in Physics. Chemistry and Biology term marks seem to be on a par although independent test scores would indicate that Chemistry achievement may be slightly higher. These suggestions were confirmed by one way ANOVAs with Scheffe post hoc analyses (Table 6.25 and 6.26).[9]

Table 6.25: Comparison of independent test scores between subjects

Variable	**F values and associated mean differences**
F Value	44.9*** (d.f.=1615)
Mean differences lie between:	
Biology score/Physics score	0.6***
Chemistry score/ Physics score	1.3***
Chemistry score/Biology score	0.7***

Table 6.26: Comparison of term marks between subjects

Variable	**F values and associated mean differences**
F value	15.4*** (d.f.=1798)
Mean differences lie between:	
Biology term mark/ Physics term mark	0.3***
Chemistry term mark/ Physics term mark	0.3***
Chemistry term mark/Biology term mark	0.0

There may be several reasons why students may be achieving less in Physics. One suggestion of interest to this work is the possibility of an association between student attitudes or beliefs relating to Physics, which tend to be lower than the other two subjects (Table 6.17), and lower student achievement. This possibility is investigated further in Chapter 9 (Section 9.2.5).

[9] A full presentation of significant and non significant results can be viewed in Section A12.3; Appendix 12.

Measurement of achievement in the two manners presented here each have their advantages and disadvantages (Section 5.1.3; Chapter 5). Although it was hoped that each measurement might confirm the other, weak correlations between independent test scores and term marks (Table 6.27) are not entirely unexpected. Such factors as teacher subjectivity included in term marks and the drawbacks in the independent test scores, related to a possible divergence from the actual curriculum taught, are likely to separate the two achievement measurements.

Table 6.27: Correlations between independent test scores and term marks.

Scores	Correlation (Pearson's r)
Physics	0.1*** (d.f.=529)
Biology	0.3*** (d.f.=526)
Chemistry	0.2*** (d.f.=527)

The low correlations between the independent test scores and teacher produced term marks has been reported previously by Kahn (1969).

Depending on the form it takes, the subjectivity inherent in the term mark is not necessarily a negative quality. Some teachers may grade students in one school higher than in another to improve motivation and others may use different criteria for assessment founded on what they see as important for the type of student they are instructing.

As with attitude and belief scales there are numerous factors that may be related to student achievement and the role of some of these background variables, as measured in this study, are presented in Table 6.28-6.33.

Table 6.28: The relationships between student, school and teacher background characteristics and Physics independent test scores

Dependent variable	Independent background variable	Correlation (r)	t-test (t)	ANOVA (F)
Physics independent test score	Student age	-0.2*** (d.f.=527)		
	Location (Coquimbo)		-2.3* (d.f.=331.3)	
	School administration (subsidised)		2.3* (d.f.=393.5)	
	Ability	0.2*** (d.f.=473)		
	School fee			5.0** (d.f.=538) A significant difference in group means lies between the highest (group 1) and the lowest fee paying group (group 3) (0.6*)
	Number of schools in which teacher works (one school only)		3.2** (d.f.=12.1)	

Table 6.29: The relationships between student, school and teacher background characteristics and Physics term marks

Dependent variable	Independent background variable	Correlation (r)	t-test (t)	ANOVA (F)
Physics term mark	Student age	-0.1** (d.f.=578)		
	Location (Coquimbo)		-0.9 (d.f.=328.2)	
	Student gender (female)		2.1* (d.f.=573.2)	
	Income per student family member	0.1* (d.f.=320)		
	Ability	0.2*** (d.f.=522)		
	School fee			12.5*** (d.f.=600) A significant difference in group means lies between the highest (group 1) and middle fee paying group (group 2) (0.5***) and between the highest (group 1) and lowest fee paying group (group 3) (0.5***)

Table 6.30: The relationships between student, school and teacher background characteristics and Biology independent test scores

Dependent variable	Independent background variable	Correlation (r)	t-test (t)	ANOVA (F)
Biology independent test score	Student age	-0.2*** (d.f.=525)		
	Location (Coquimbo)		-2.6** (d.f.=287.7)	
	Father's education			14.9*** (d.f.=348) A significant difference in group means lies between the highest educated group (group 1) and the middle educated group (group 2) (0.9*) and between the highest educated group (group 1) and the least educated group (group 3) (1.7***)
	Mother's education			11.4*** (d.f.=363) A significant difference in group means lies between highest educated group (group 1) and the least educated group (group 3) (1.4***) and between the middle educated group (group 2) and the least educated group (group 3) (1.1**)
	Income per student family member	0.3*** (d.f.=290)		
	School administration (subsidised)		10.3*** (d.f.=393.8)	
	Ability	0.4*** (d.f=471)		
	School fee			48.0*** (d.f.=536) A significant difference in group means lies between highest fee paying group (group 1) and lowest fee paying group (group 3) (1.9***) and between middle fee paying group (group 2) and lowest fee paying group (group 3) (2.1***)

Table 6.31: The relationships between student, school and teacher background characteristics and Biology term marks

Dependent variable	Independent background variable	Correlation (r)	t-test (t)	ANOVA (F)
Biology term marks	Student age	-0.1*** (d.f.=576)		
	Location (Coquimbo)		-2.0* (d.f.=322.2)	
	Student gender (female)		4.8*** (d.f.=579.7)	
	Ability	0.2** (d.f.=520)		
	School fee			5.4** (d.f.=598) A significant difference in group means lies between highest fee paying group (group 1) and the middle fee paying group (group 2) (0.3**).

Table 6.32: The relationships between student, school and teacher background characteristics and Chemistry independent test scores.

Dependent variable	Independent background variable	Correlation (r)	t-test (t)	ANOVA (F)
Chemistry independent test score	Student age	-0.1* (d.f.=529)		
	Father's education			11.2*** (d.f.=352) A significant difference in group means lies between the most educated group (group 1) and the least educated group (group 3) (1.1***)
	Mother's education			5.2** (d.f.=367) A significant difference in group means lies between the highest educated group (group 1) and the least educated group (group 3) (1.0**)
	Income per student family member	0.2*** (d.f.=295)		
	School administration (subsidised)		5.7*** (d.f.=418.5)	
	Ability	0.3*** (d.f.=48)		
	School fee			15.4*** (d.f.=539) A significant difference in group means lies between highest fee paying group (group 1) and lowest fee paying group (group 3) (1.1***) and between middle fee paying group (group 2 and lowest fee paying group (group 3) (1.2***)
	Number of schools in which teacher works (one school only)		2.4* (d.f.=11.3)	

Table 6.33: The relationships between student, school and teacher background characteristics and Chemistry term marks

Dependent variable	Independent background variable	Correlation (r)	t-test (t)	ANOVA (F)
Chemistry term mark	Student age	-0.2*** (d.f.=576)		
	Location (Coquimbo)		-3.7*** (d.f.=293.5)	
	School administration (subsidised)		4.2*** (d.f.=442.2)	
	Ability	0.2*** (d.f.=519)		
	School fee			3.9** (d.f.=598) A significant difference in group means lies between highest fee paying group (group 1) and lowest fee paying group (group 3) (0.2*)

6.4.1. Student ability

The natural ability of the student was positively associated with all achievement measures in all subjects. This relationship is supported by much literature (e.g., Steinkamp & Maher, 1983; Velez *et al.,* 1994; Aghadiuno, 1995). The strength of the correlation between independent test scores and natural ability in Chemistry and Biology was greater than that with the respective term marks in each subject. It may be suggested, therefore, that weaker correlations between term marks and ability is an indication of some of the subjectivity associated with the award of the term mark by the teacher.

The reversal of this trend in the Physics scale was of some concern indicating perhaps that Physics teachers are more objective in their grade allocation. An explanation for this could be that Physics may be more structured in its testing, in that like Mathematics, answers are easily defined as right or wrong. The objectivity of marking is, therefore facilitated. In Chemistry, and Biology in particular, the nature of the testing may be more open to the subjective judgement of teachers, e.g. the allocation of a grade to a Biology essay for example. Alternatively, some fault may lie in the independent Physics scale.

6.4.2. Student age

The age of the student was consistently negatively correlated with all subject independent scores and term marks indicating that students that are repeating, or have repeated, continue to have difficulty with the subject at hand. This is an agreement with other studies in Latin America and the Caribbean and points to the fact that making students repeat the year does not have a positive, remedial effect on their achievement (Velez *et al.,* 1994).

6.4.3. School fees

The amount of school fees paid was also associated with achievement measures and across all of the subjects. In most instances schools in the higher fee paying bracket significantly outperformed schools in the lowest group. As the school fee paid is an indicator of socio-economic status, the influence of such a variable is not unexpected. There is much literature that supports the influence of socio-economic status on student achievement in general (e.g., Comber & Keeves, 1973; Coleman, 1990), in Latin America (Velez *et al.,* 1994) and in Chile (Zurita Miranda, 1990; Macias Carcamo, 1987) and it is reassuring that it is found to be a factor of importance in this research also.

6.4.4. Socio-economic status

Other socio-economic status indicators feature, although not with the same consistency. The income per student family member is of relevance to the independent Biology and Chemistry scores and Physics term marks, and parental education is relevant to the Chemistry and Biology independent scores. With respect to the latter indicator, differences were mostly found between those students whose parents had some experience of tertiary education and those whose parents had not completed a secondary level of education.

Owing to economic conditions, some students may be employed as well as engaged in school. This factor in isolation does not influence achievement (Ceri, 1989) but interacts with variables of student absence, intelligence and the number of hours set aside for study outside of school hours, which are of importance. The family background of the student may comprise of more than their socio-economic status, the

participation of parents in activities related to the child's studies being an additional factor which may be influential in achievement (Muñoz Arias *et al.*, 1994).

None of these factors have been measured in this research but it is conceivable that they might provide some partial explanation as to why socio-economic status has been shown to have a role in achievement in Chilean students. Material and nutritional differences could also be considered.

6.4.5. Administration

School administration was relevant in the independent measures of achievement of all subjects and additionally in the Chemistry term mark, private subsidised schools consistently showing better results. This is likely to be associated with the socio-economic status of students attending these schools (Section 6.1) and the funding made available to the institution. It would be interesting in future research to investigate also the effect of other distinctions between the two administrations, such as disparities in management styles: subsidised schools have been criticised as being overly controlling of their teachers (Gysling, 1992b). Municipal schools are under the management of the mayor who may have little or no experience in education (Aedo-Richmond & Richmond, 1996).

As students in subsidised schools also show better *attitudes* to their Biology teachers and Biology classes and report their Chemistry and Biology teachers as better satisfied (Table 6.19-6.21) there is some anticipation that achievement may be related to these attitudes and beliefs in someway.

6.4.6. Location of school

As with the analysis of the attitude and belief scales, it was noted that the location of the school was of importance in all of the achievement measures with the exception of the Chemistry independent test scores and the Physics term marks. In all instances, better achievement was recorded by students in La Serena. It had been felt that location might be an indicator of socio-economic status and that this might explain the differences in achievement. This assumption lacked support, however, because the only socio-economic status indicator associated with location was the amount paid to the school in fees (Table 6.04).

Alternatively, teachers from Coquimbo are younger than those in La Serena and are more likely to be working in more than one institution (Table 6.13). This may have influence on student achievement in so far as younger teachers may be less pedagogically experienced or, if working in more than one institution, unable to devote sufficient time to, or be as involved with, and committed to students extracurricularly or even during class time.

6.4.7. Student gender

Gender did not seem to be a central issue in student performance although female students were awarded higher term grades in Biology and Physics. The lack of relationship in any of the independent achievement measures led to the belief that the award of these grades is inter-linked with criteria other than achievement alone. Behavioural issues, such as poor discipline, may be more predominant among male students and influence teachers when they award their grades. The lack of association between science achievement and gender is contrary to some findings (Comber & Keeves; 1973; Steinkamp & Maher, 1983) where male students achieve better in science, especially in Physics, and it would be pleasant to believe that the trends that these authors identified, have been neutralised.

As with the attitude scales, teacher background characteristics did not feature largely in those found to be related to student achievement. This deficiency was surprising as the instance of teacher characteristics influencing student characteristics is well demonstrated in many other studies (e.g., Comber & Keeves, 1973; Kelly, 1980, Arancibia & Maltes, 1989; Velez *et al.*, 1994). It may be of course that less relevant teacher characteristics were chosen for analysis and that other variables, of use previously in Latin America, could be measured in future research; years of training, for example. The lack of relationship with some teacher variables, gender, for example, is in line with findings elsewhere in Latin America (Velez *et al.*, 1994). Teacher age was also not among the few relevant teacher variables affecting achievement, which does not substantiate the theory that younger teachers in the Coquimbo are less able to maximise the outcomes of their students, as previously suggested (Section 6.4.6).

6.4.8. Number of institutions in which teacher works

Interestingly, however, a relationship is calculated between the number of schools in which a teacher works and student achievement in favour of teachers working in one

institution alone (Chemistry and Physics independent scores). This leads to a preference for the explanation (presented in Section 6.4.6) that lower achievement in Coquimbo is related to the proportion of teachers there that work in more than one institution and the lack of involvement in the school that this may create.

There are of course numerous student and school variables that have not been measured or analysed here that if included might have enriched the image being created of the teacher and student sample at hand. Students attending urban single sex, bigger schools, perhaps with more facilities, and attending morning shift classes, for example, are more likely to show better achievement (Velez *et al.* 1994).

6.5. Teacher satisfaction scales

Descriptive statistics for teacher overall job satisfaction and job component scales (Appendix 13) show that variation in the distributions of these are sufficient for effective analysis. Teachers are generally satisfied with their work, their mean rating on the overall job satisfaction scale (0.7) falling between the "to some extent" (0.5) and the "a great deal" (1.0) divisions. This was greater than might have been expected (see Sections 3.7 and 3.8; Chapter 3) but Cornejo & Rodríguez (1997) also found that when questionnaires alone were relied upon to measure job satisfaction, work and professional satisfaction are reported as high. The authors suggest this had largely to do with teachers responding to what they thought was socially acceptable and that deeper probing using group discussion and life history techniques found greater professional and work dissatisfaction to exist. Higher ratings of overall job satisfaction as reported in Appendix 13 need to be considered with some caution if heed is taken of the above discussion.

It would be interesting to compare the ratings made on scales by these science teachers with those from teachers of other subjects. Such interest stems from work conducted on teacher attitudes to educational issues in which science teachers tended to score amongst the highest in traditional views compared to humanity teachers who tended to be more innovatory (Kelly *et al.*, 1985). If such findings could be extended to an association between traditional thinking and being less critical of the establishment, then the high scale ratings of the individual and overall job scales would appear less surprising in this sample's science context. Informal discussion with one Chilean humanity teacher on these high satisfaction scores led to a similar conclusion.

Gysling (1992b) would criticise this argument as over simplistic, however. In a study comparing Biology and Spanish language teachers' views of their respective curricula, she suggests that greater criticism from humanity teachers stems from the higher relevance of the Biology curriculum both in university entrance examinations and to real life than that of Spanish language. Students are perhaps more motivated in Biology than Spanish, which causes Spanish teachers to be less satisfied with this curriculum.

With respect to the present research, science teachers may have more with which to be satisfied than other subject teachers because improvement in infrastructure, for example, including the availability laboratory facilities, is high on the MECE agenda and is being made visible to them. Other subjects, as was suggested also through informal discussion with some humanity teachers, may see less improvement to their areas and be more critical as a result. This conjecture, however, would need to be substantiated empirically.

Differences in traditional thinking has also been noted in smaller towns and larger cities, the latter tending to be less traditional in their views (Kelly *et al.*, 1985). The results of the present study may conceivably, therefore, have been very different if it had been conducted in Santiago.

If the means for each reward scale of each subject, as well as the teacher sample as a whole, are considered (Table A13.01; Appendix 13), it is demonstrated that teachers consistently score the content of their work highest, i.e. they see teaching as highly interesting, intellectually stimulating and able to provide them with opportunities for creativity. This was followed by teachers' perceptions of the management in the school and general morale and then by the student characteristics scale describing students in terms of the nature of their attitude, achievement, responsiveness, etc.. Lortie (1975) forwards the notion that teachers derive their greatest rewards from those events related to the classroom and, although the usable scales formulated in this thesis have not allowed for a direct measurement of classroom activity, it is interesting that, with the exception of management and morale, the top scales are indeed what Lortie might have classified as task related. Contrary to concerns of over-controlling directors in some subsidised schools and apathetic municipalities in municipal schools, teachers rate the

adequacy of relations with management highly, although this may reflect a distrust in the destination of the questionnaire.

When reviewing the other end of the reward spectrum (Table A13.01; Appendix 13) one finds that opportunities for career advancement and administrative responsibility are seen as present in the least degree across all four teacher groupings with material rewards featuring in the general and Physics samples, opportunities for personal and professional development in the general, Physics and Biology samples, relations between the school and the community in the Biology and Chemistry samples and physical working conditions in the Chemistry sample. In contrast to the highest scored job characteristics, these facets are associated less with the job of teaching itself than with extrinsic components of the profession.

Criticism by the Colegio de Profesores de Chile (1997a; 1997b) of the inconsistent assignment of postings in the profession, ties in with teachers' general perceptions in the present findings that issues around career advancement are not adequate. This fact is not a feature peculiar to teachers in Chile either, with Lortie (1975) in the US, for example, describing teaching as relatively unstaged or planar with no clear career hierarchy or progression evident.

The opportunities for personal and professional development are not highly perceived, which may originate from the lack of occasion for Chilean teachers to participate in in-service training (Errázuriz *et al.*, 1994). Low satisfaction with this facet of the job has been reported elsewhere in the Chilean literature (Diaz Hernandez, 1990).

Material rewards, in the general and Physics sample, was one of the lower scored scales although it was surprising, as this is a central issue in the frequent strike actions, that it had not been rated consistently lower across all subject disciplines. Dissatisfaction with material rewards is again substantiated by other Chilean research (Diaz Hernandez, 1990; Delano *et al.*, 1991).

Value ratings are higher than those for rewards, no figure falling below 0.6 (Table A13.01; Appendix 13). When ranked, administrative responsibility, as with reward scales, features consistently low in the hierarchy. This would indicate that teachers do not feel it important to become involved in activities that are less student orientated such

as the induction of new teachers or supervision of student teaching. This lack of interest extends even to activities that are student orientated such as pastoral care and running of clubs but that are not related specifically to classroom activity. Low valuation of participation in administrative responsibility, makes the apparent low involvement in such functions, as measured by the reward scale, unsurprising. There is the possibility, however, that lack of involvement in such activity is not simply through a lack of interest or valuation of such activities, but that the opportunity to become involved may not be made available.

Relationships with colleagues are seen as relatively less important by Chemistry teachers and it is interesting to remember that Chemistry teachers appear more likely to work in 2 or more institutions (Table 6.09). As relationships are perhaps harder to form in such circumstances, when involvement with the school is lower, it may be that teachers chose to work in this fashion because collegial interaction is less important to them. It does not necessarily follow that relationships with colleagues are less favourable, however (this characteristic did not feature particularly highly or lowly in the reward ranking). In fact, Gutierrez Sanchez *et al.* (1997), for example, find that those teachers holding down jobs outside teaching (who may face similar problems of school involvement to those teachers working in several schools) are in fact particularly satisfied with their relationships with colleagues.

The same authors showed that teachers who did not work outside of teaching profession were better satisfied with the work itself and feelings of belonging than those teachers who held down supplementary jobs outside of the profession. The higher rating on belonging scales associated with teachers working only within teaching would seem likely to increase even further if the teacher was confined to working in one establishment alone. One might then ponder on how such feeling of belonging could translate into increased commitment to the school and the student within it.

Intrinsic components of the job are thought to be valued most by teachers (Lortie, 1975, Nias. 1981) and whilst this was the case here with work content (all four teacher groups) and student characteristics (total sample and in Physics teachers) scales, extrinsic rewards such as the opportunities for career advancement (as discussed above) and the material rewards (whole teacher sample, Chemistry and Biology sample) also featured in these higher values. Teachers are unlikely to strike over issues such as wage if the

issue in reality is of little importance to them. The fact that material rewards featured in the lower end of the reward hierarchy but is valued highly would indicate that it is a theme very likely to be causing feelings of dissatisfaction. In a similar vein, high valuations of career advancement but low perceptions thereof, point to this being a potential source of dissatisfaction also. Chapter 7 will investigate this further.

It would seem appropriate at this stage to consider the possibility of interaction between values and rewards as proposed by Kalleberg (1977) and Poppleton (1989) where the valuation of a job characteristic affects the manner in which the job component is perceived. This may be occurring in the material reward and perhaps in the career advancement scales. Biology teachers, for example, value career advancement highly and this is likely to make them susceptible to disappointment, perceiving career advancement as less than adequate. A similar argument may be made for the Physics and general teacher samples who value material rewards fairly highly. This makes it very likely that actual material rewards will not live up to expectation. This does not consistently seem to be the case, however, as in the work content scale the characteristic is both well valued and perceived to be highly present. An investigation of such possible interaction, accompanied by more thorough classification of the nature of the more relevant job characteristics, is analysed and discussed in detail in the following chapter.

Deeper explanation as to why teachers hold the perceptions and values they do and why they have placed them in the hierarchy they have, is beyond the scope of the present study. Interactions with background characteristics may initiate some understanding, however.

6.6. Relationships between teacher satisfaction scales and background characteristics

Examination of job component and overall job satisfaction means (Appendix 13) indicated that small differences existed between the ratings of the different subject teachers. To investigate the significance of these differences, one way ANOVAs were conducted on the data (Table 6.34).

Table 6.34: Comparison of overall and job component scales by subject

Variable	One way ANOVA (F value)
Administrative responsibility (reward)	0.4 (d.f.=34)
Administrative responsibility (value)	0.9 (d.f.=34)
Career advancement (reward)	1.0 (d.f.=39)
Career advancement (value)	2.5 (d.f.=43)
School and Community relations (reward)	0.0 (d.f.=45)
School and Community relations (value)	0.1 (d.f.=46)
Management and morale (reward)	0.8 (d.f.=41)
Management and morale (value)	0.6 (d.f.=40)
Material rewards (reward)	0.7 (d.f.=41)
Material rewards (value)	1.2 (d.f.=41)
Personal and professional development (reward)	0.6 (d.f.=35)
Personal and professional development (value)	1.5 (d.f.=34)
Physical working conditions (reward)	0.9 (d.f.=45)
Physical working conditions (value)	0.4 (d.f.=47)
Relationship with colleagues (reward)	0.1 (d.f.=42)
Relationship with colleagues (value)	0.4 (d.f.=44)
Responsibility for student progress (reward)	0.1 (d.f.=40)
Responsibility for student progress (value)	2.1 (d.f.=39)
Student characteristics(reward)	1.7 (d.f.=45)
Student characteristics(value)	2.6 (d.f.=44)
Work content (reward)	0.9 (d.f.=47)
Work content (value)	2.2 (d.f.=47)
Work load (reward)	0.1 (d.f.=44)
Work load (value)	0.3 (d.f.=44)
Overall job satisfaction	0.2 (d.f.=46)

No differences were found either between the overall job satisfactions of the teachers in the three subject groups, between their perceptions of the various job components or between the value placed upon them. This demonstrates that teachers in the three sciences share common value systems and that their perceptions of their work are not markedly different (at least in those components measured here). It suggests that the working situation of science teachers in general is fairly similar and that they share common challenges and rewards. For example, the need to have sufficient laboratory space or control students during such practical lessons are challenges faced in all three of the subject areas. These similarities are in line with the findings that showed only two background characteristics to differ in their associations with different subject teachers, namely teacher gender and the number of institutions in which teachers work (Table 6.08, 6.09 and 6.10).

Although differences in teacher affect were not distinguishable by the subject taught, it is feasible that other background characteristics interact with these scales. Significant relationships are presented in Tables 6.35-6.39 (a full presentation of analyses being displayed in Section 12.4; Appendix 12).

Table 6.35: Relationships between student age and ability with teacher reward and value scales (Correlations)

Characteristics	Student age		Student ability
	Chemistry (d.f.=17)	Biology (d.f.=17)	Biology (d.f.=17)
School and Community relations (reward)	-0.6*	-0.6*	0.6**
Student characteristics(reward)	-	-0.6*	-

Table 6.36: Relationships between of teacher age, experience and income per family member with teacher reward, value and overall satisfaction scales (correlations)

Characteristics	Teacher age			Teacher experience			Income per teacher family member			
	Total sample (d.f.=42)	Chemistry (d.f.=17)	Biology (d.f.=17)	Total sample (d.f.=45)	Biology (d.f.=17)	Chemistry (d.f.=15)	Total sample (d.f.=36)	Physics (d.f.=10)	Biology (d.f.=17)	Chemistry (d.f.=15)
Overall job satisfaction				0.3*						
Management and morale (value)										-0.6*
Material rewards (reward)	0.3*									
Personal and professional development (reward)				0.3*				0.9**		
Personal and professional development (value)										-0.7**
Physical working conditions (reward)		0.5*		0.3*		0.5*				
Responsibility for student progress (reward)										
Student characteristics(value)							-0.4**			-0.9***
Work content (value)										-0.6*
Work load (value)			-0.6*		-0.7**				-0.6*	-0.6*

Table 6.37: Relationships between total hours worked, hours worked in a particular institution and years of tenure at school with teacher reward, value and overall job satisfaction scales (correlations)

Characteristics	Total hours worked by teacher		Hours worked in particular school		Years at particular school	
	Total sample (d.f.=40)	Chemistry (d.f.=16)	Chemistry (d.f.=16)	Physics (d.f.=12)	Chemistry (d.f.=16)	Biology (d.f.=14)
Overall job satisfaction				0.7**		
Administrative responsibility (reward)			0.6**			
Career advancement (reward)				0.8**		
School and Community relations (reward)				0.6*		
Management and morale (reward)				0.6*		
Personal and professional development (reward)	-0.3*					
Personal and professional development (value)		-0.2*				
Relationship with colleagues (reward)					-0.5*	
Responsibility for student progress (reward)			0.6*			
Work load (reward)			-0.6*		-0.5*	
Work load (value)						-0.8***

Table 6.38: Relationships between location of school, school administration type and teacher reward and value scales (t-tests)

Characteristics	Location of school (Coquimbo)				Administration (subsidised)	
	Total sample	Chemistry	Physics	Biology	Total sample	Physics
Community-School Relations		-3.0* (d.f.=9.7)				
Material rewards (reward)					2.4* (d.f.=39.3)	
Personal and professional development (value)	2.1* (d.f.=40.1)			2.4* (d.f.=13.5)		-2.3* (d.f.=9.00
Physical working conditions (reward)		-3.2** (d.f.=14.5)				
Physical working conditions (value)			4.2** (d.f.=8.0)			

Table 6.39: Relationships between teacher gender, the number of establishments in which a teacher works and teacher reward, value and overall job satisfaction scales (t-tests)

Characteristics	Teacher gender (female)			Number of establishments in which work (1 school alone)		
	Chemistry	Physics	Biology	Total sample	Physics	Biology
Career advancement (reward)	.1**(d.f.=14.1)					
Management and morale (reward)	3.9**(d.f.=13.0)					
Management and morale (value)	2.4*(d.f.=13.0)					3.2*(d.f.=10.0)
Personal and professional development (value)				-2.8**(d.f.=37.3)		4.3** (d.f.=12.9)
Student characteristics(reward)			- 3.9**(d.f.=14.9)	2.4*(d.f.=28.3)	2.5*(d.f.=8.9)	
Work content (value)	2.9*(d.f.=13.00)					
Work load (reward)	4.1**(d.f.=13.3)					
Overall job satisfaction		-2.6* (d.f.=5.7)				

In the discussion that follows of the relevant background variables linked with teacher reward and value scales, an attempt has been made to relate the results calculated to the scarce Chilean literature on job satisfaction. In none of these studies, however, is satisfaction partitioned into reward and value components as it is here. Comparison can be, therefore, only somewhat limited in its usefulness.

6.6.1. Working hours and number of institutions in which teachers work

In a consideration of the background variables that were linked with the job component and overall satisfaction scales, the number of hours a teacher works in the school, where the questionnaire was applied, was most prolific in its associations (Table 6.37). Relationships were formed consistently with the reward scales or the perceptions teachers have of the degree to which certain characteristics are present in their jobs. One might consider the assumption that a higher number of working hours in a school would lead to more involvement in the school and possibly a greater commitment. As in all but one instance the relationship was positive, it might be that this greater involvement results in a teacher perceiving particular job characteristics in a more positive light.

The job components that were particularly associated with the hours worked in a particular establishment were those related to the relationships between community and school, the amount of administrative responsibility held, the opportunities for career advancement, management and morale, responsibilities held for student progress and overall job satisfaction scales. The greater ratings on the two responsibility scales are easier to explain as teachers, more involved in the school, would be more inclined to participate in extra class activity. Additionally, opportunities for career advancement may be more forthcoming for these teachers. Spending more time in the establishment may also be conducive to the formation of better relationships with management and perhaps an appreciation of management policy.

The relationships between hours in the particular school and relations between the community and the school (Table 6.37) are more difficult to assess but may be an indication again that teachers less involved in the institution feel undervalued in several ways and this causes them to feel the lack of support and respect from parents and society more acutely. Finally, if teachers perceive several characteristics to be better if they work more hours in an institution, then the influence of the number of work hours upon their feelings of overall job satisfaction is not surprising.

The only negative relationship with the number of work hours in a particular school and a reward scale involved the perception of the appropriateness of the workload experienced. Teachers who worked more hours in the institution perceived their workload to be less tolerable. These teachers may find their extra involvement in the school leads to more responsibilities being placed upon them and that makes the pressure of work upon them greater.

There are two conceivable reasons why teachers may be working fewer hours in a particular school. The first is because of home or other non-school related commitments, the teacher has chosen to work to only a limited timetable. The second possibility is that the teacher has little choice in the matter as the school does not offer any additional employment. In the latter instance the teacher may be forced to seek employment in another institution so as to survive economically.

The number of establishments in which a teacher works (Table 6.39) was related to both reward (student characteristics) and value (personal and professional development and management and morale) scales of job characteristics. With regard to the value scales it may be that teachers have chosen to work in one institution alone so as to fit in with values they hold. Working in one institution may in their minds be associated with being able to participate in courses of personal and professional development provided or funded by the school. Teachers who see this as important may make the effort to gain full time employment in a single institution. This may be true in Biology teachers, the majority of who do work in one institution and for whom higher valuation of personal and professional development was associated with teachers working in a single institution. In the total sample, however, it is those teachers working in 2 or more schools that value this characteristic highly. An alternative explanation in this context, therefore, may be that teachers that do not have opportunities for personal development because of not being committed to a single institution, may exaggerate their value of this characteristic because the absence thereof has made it salient to them.

Values may also form in retrospect, i.e. they form after exposure to the job characteristic. Teachers, for example, working in a single school, develop stronger and possibly better relationships with management, and subsequently begin to feel that this is important to their work life. Teachers that do not have strong ties with the school,

being spread between other establishments, may not find this a salient feature and, therefore, not value it highly.

Working in one institution is also associated with teachers rating the characteristics of their students more favourably. This, as for the work hours variable, may be associated with increased teacher involvement in the school allowing for the development of better relationships with students.

As relationships, in the teacher sample as a whole, had been shown previously to exist between the number of work hours in a single institution and the number of institutions in which a teacher works (Table 6.13), a greater congruence was expected between the results produced for each of these two variables than was actually observed (Table 6.37 and Table 6.39). As the relationship between work hours in one institution and working in more than one establishment was subsequently found to be largely attributable to the significance of this relationship in the Chemistry teacher sample (Table 6.13), it was concluded that teachers, other than those in Chemistry, who report lower working hours in the institution under study, do so for reasons other than the fact that they have had to spread themselves thinly between several institutions, i.e., they may be working fewer hours to fit in with family commitments.

It would be interesting to compare these results on the satisfaction of teachers working shorter hours and/or in more than one institution, with findings on satisfaction in temporary workers (Ellingson *et al.*, 1998). This latter research showed that temporary employees, who were in this type of employment through necessity, were less satisfied than those who had chosen the situation more voluntarily. Bearing this in mind, further investigation could be directed into whether Chilean teachers, employed for shorter hours in several institutions, are doing so on a voluntary (e.g. to coincide with home obligations) or a non voluntary basis (e.g., they are unable to negotiate an adequate contract in any one school). This is especially recommended as the relationship between worker performance and satisfaction is significant in temporary workers and less evident in permanent employees. It is suggested that temporary employees may have a lesser sense of obligation to the organisation, and if dissatisfied choose to perform badly, whereas full time employees are more obliged to continue to perform well despite their dissatisfaction (Ellingson *et al.*, 1998).

A final relationship on this theme was detected in the Chemistry sample, showing a negative association between *total* working hours and the valuation of personal and professional development (Table 6.37). A similar relationship was found in the total teacher sample although with the reward scale of this same characteristic. Teachers with longer hours are unlikely to find time to engage in such developmental activity and, seeing it as an impossibility, not regard it as an important aspect of their job.

A general recommendation, from the findings so far described, would be that teachers are encouraged and given the opportunity to commit more fully to one establishment, so that the work experience may be more satisfying for them.

6.6.2. Teacher gender

Teacher gender appeared to be of relevance in analysis (Table 6.39) although it should be remembered that, despite the rigorous nature of the t-test, for which the more stringent unequal variance method has been chosen, the distribution of gender across the teacher sample, especially by subject, is not an even one (Table 6.07).

Female Chemistry teachers perceived career advancement opportunities more positively than their male colleagues and it is conceivable that male teachers in the sample were more career-orientated, viewing the opportunities for career advancement, in an unstaged career such as teaching, less favourably than do female colleagues. Male teachers, on the other hand, value good relations with management better than female teachers, a fact perhaps also related with their desires to advance in their career.

Differences in the *values* placed upon work content and management and morale scales, point to different *expectations* between the two genders. Male teachers may see actual work content as essential to satisfaction, where female colleagues consider this to be less important. If this could be extrapolated (a task for further research) to differences in male and female workers in general, it might explain why female employees demonstrate overall job satisfaction on a par with male workers, even though they are more likely to be employed in jobs where intrinsic job satisfaction is lower (Weaver, 1980).

Male Biology teachers appear to perceive their relationships with students in a more favourable light than do female teachers which may arise if female teachers face more

discipline problems and, therefore, perceive the relations with students to be problematic.

Gender differences may reflect the different experiences male and female teachers have of their working lives but they represent differing dispositions also. There is the possibility that males are less critical or more accommodating than their female colleagues and, hence, either actually perceive job characteristics such as management and morale and workload to be adequate or are at least more inclined to report them as so. The fact that in Physics, where male teachers predominate, male teachers report greater overall job satisfaction, may be a further indication of this.

Much of the above is supposition and larger, more equally distributed samples are required before these issues can be explored further.

6.6.3. Income per teacher family member

Another variable that seemed to arise frequently in the review of those that were significant was the income per teacher family member (Table 6.36). This was included in data measurement to gain an insight into the economic state of the teacher and her family, seen as important since teacher salary is a central issue in the Chilean context. Seven of the eight relationships uncovered were formed with value scales, all of which were negatively associated with the income per member of the teacher's family. This suggests that the less affluent the teacher's financial situation, the more likely were they to value certain job characteristics highly (specifically management and morale, personal and professional development, work content, work load and student characteristics). This may reflect a transfer of values where teachers, unable to justify their remaining in the profession by their receipt of good economic returns, develop positive valuations of other aspects of their profession in compensation (Salancik & Pfeffer, 1978). Their positive valuations of work content and the interaction with students are by no means new (Lortie, 1975; Nias 1981).

Teachers in more affluent homes scored significantly higher in one reward scale only, personal and professional development. As teachers often cannot rely on the sponsorship of their schools in attendance of personal and development courses run outside the school, it may only be the more affluent teachers that can afford to enrol in these programmes. Teachers of this type are more likely, therefore, to feel that they are

receiving adequate opportunities for personal and professional development within their work.

6.6.4. Administration and student age

It was initially expected that differences would be found between the teachers' perceptions of job characteristics in the different school administrations (Table 6.38). Such differences have been found elsewhere in Chile with private subsidised school teachers showing greater satisfaction in some studies (Ministerio de Educación, 1994; Gutierrez Sanchez *et al.*, 1997) although less satisfaction in others (Rojas Olavarria, 1995). Furthermore, student perceptions of teacher satisfaction were distinct in municipal and subsidised schools (Section 6.2.4.), students perceiving teacher in subsidised schools to be better satisfied.

In the sample analysed in the present thesis, two significant results were obtained, the first in the scale measuring the manner in which teachers evaluated the importance of personal and professional development, municipal teachers seeing it as more important. More information would be required on the differences in in-service provision in the two school types before this difference could be fully understood. It could be hypothesised, however, that in-service training or course attendance are less possible in the municipal sector, due to financial constraints. This dearth may cause municipal teachers to value these activities more than do their private subsidised colleagues.

Secondly, teachers in subsidised schools were more likely to provide higher ratings of their material rewards. This ties in with findings that showed municipal teachers to be from households of less income (Section 6.2.4; Footnote 8). It also ties in with the perceptions of students who saw Biology and Chemistry teachers within municipal establishments as less satisfied (Table 6.21).

It was interesting to note that, although the socio-economic status of students in the two school administrations was found to be so different (Tables 6.01-6.04), teachers' perceptions of the characteristics of their students was not found to be significantly distinct (Table 6.38). The rating on this scale was affected (in Biology) by the average age of the class, however, with higher age averages (probably due to greater repetition) appearing to be more problematic for the teacher (Table 6.35).

A similar negative relationship between average class age and perceptions of community school relations was also found in both Biology and Chemistry teachers (Table 6.35), suggesting that the level of repeating students is allied with not only the way teachers view the students in the class but also their relationships with the members of the community from which they are drawn, parents, for example.

6.6.5. Location of school

Teachers working in different locations valued some job components differentially, Physics teachers in Coquimbo, for example, indicated that they valued their working conditions more than their colleagues in La Serena (Table 6.38). If one accepts that Coquimbo is a poorer region and that, as lesser school fees may indicate, conditions are poorer within the school, then the importance placed upon this characteristic is understandable, assuming that the absence of adequate physical working conditions heightens the importance placed upon it. Again note should be made of the fact that the distinction is found amongst Physics teachers who, as argued before, may be more reliant upon physical resources to teach their subject. Students have also been shown to perceive Physics teachers as less satisfied in Coquimbo, which may reflect the situation just described (Table 6.21). It was Chemistry teachers in Coquimbo, however, that report significantly less adequate physical working conditions (Table 6.38). This supports the premise that Coquimbo is an area of poorer resourcing but not that this is particularly an issue for Physics teachers.

In the Biology and the teacher sample taken as a whole, teachers in Coquimbo gave greater importance to opportunities for personal and professional development. The same argument that financial constraints make this less possible and so increase the importance of the job characteristic, can be drawn upon.

Chemistry teachers in La Serena were more likely to perceive relations between the community and the school to be adequate. Although the school fee was the only indicator that the socio-economic status of Coquimbo was lower, there are areas in the region such as Tongoy and Tierras Blancas where the socio-economic status of the student and the school would visually appear to be very different from that observed in La Serena. Parental support and rapport may be more difficult to establish in these poorer communities.

6.6.6. Years of service at school

Chemistry teachers who had been at the institution for a longer period of time rated their relationships with colleagues and their workloads less positively (Table 6.37). With regard to the former, it is hard to say why familiarity might breed contempt amongst longer serving teachers. In the latter a concern with workload might reflect pressures from added responsibilities taken on as a result of being at the school for longer. Interestingly, this seemed in contrast to Biology teachers who the longer they had been at the establishment (and the more experience they had), the less likely they were to see work load as an important issue. This would favour the argument that teachers adjust to work pressures that they find all consuming at the onset of their career, but learn to cope with this as they become more skilled in the job. An adequate workload, hence, becomes a less salient feature in their value systems.

6.6.7. Teacher age and experience

Much of the Chilean literature on job satisfaction considers the influence of teacher age and experience upon satisfaction, concluding that differences occur both in the level of satisfaction measured and in the job characteristics seen as relevant (Diaz Hernandez, 1990; Cornejo & Rodríguez, 1997; Gutierrez Sanchez *et al.* 1997).

In this thesis, more experienced teachers in the total sample tended to report greater opportunities for professional and personal development, also reporting themselves to be better satisfied overall (Table 6.36). More favourable reports were also made of physical working conditions by both the total and Chemistry teacher sample. Finally, more experienced Biology teachers feel that an adequate workload is less important, a findings in line with findings described in the previous section (Section 6.6.6) in teachers of greater years of service.

Three associations with teacher age could be made. In the total sample, age was positively connected to material rewards. This is not surprising as one assumes that as the teacher becomes more experienced his salary will increase accordingly.

Correlations with the income per teacher family member and teacher age were not significant but proved to be so when the teacher family income alone was considered[10]. Furthermore, older Chemistry teachers perceive their physical working conditions to be more adequate than younger colleagues do, while younger Biology teachers place greater value upon an appropriate workload. Perhaps older teachers have resigned or accustomed themselves to the physical conditions in which they work, while younger teachers, struggling to adapt to the pressures of the new job, find workload an important issue.

In previous studies (Cornejo & Rodriguez, 1997; Gutierrez Sanchez *et al.,* 1997) it had been shown that relationships between age and satisfaction were not linear, and that a drop in satisfaction occurs in middle age group teachers. The teacher age variable was categorised, therefore, into 3 age groupings as described in Table 6.40.

Table 6.40: Teacher age categories

Age Grouping	Number and percentage of teacher sample
Total sample	
Group 1 (0-35.7 years)	14 (31 %)
Group 2 (35.8-45.3 years)	14 (31%)
Group 3 (45.4-72.0 years)	14 (31%)
Missing	3 (7%)
Chemistry sample	
Group 1 (0-35.7 years)	6 (35%)
Group 2 (35.8-45.9 years)	4 (24%)
Group 3 (46.0-72.0 years)	5 (29%)
Missing	2 (12%)
Physics sample	
Group 1 (0-35.9 years)	3 (25%)
Group 2 (36.0-39.7 years)	4 (33%)
Group 3 (39.8-72.0 years)	5 (42%)
Missing	5 (42%)
Biology sample	
Group 1 (0-33.3 years)	6 (35%)
Group 2 (33.4-42.3 years)	6 (35%)
Group 3 (42.4-72.0 years)	5 (29%)
Missing	0 (0%)

One way ANOVAs were conducted for the job satisfaction scales and overall job satisfaction scale by age group. Although no differences were found for the total sample, significant differences were detected between age groups in the subject samples (Table 6.41).

[10] Correlation between teacher family income and teacher age=0.5** (d.f.=38)

Table 6.41: Relationships between teacher age and job characteristic and overall job satisfaction scales

Variable	One way ANOVA (F value)		
	Chemistry sample	Physics sample	Biology sample
Career advancement (value)			8.5** (d.f.=16) A significant difference in group means lies between groups 1 and 2 (0.1*) and groups 2 and 3 (-1.3*)
Personal and professional development (value)		23.6*** (d.f.=11) A significant difference in group means lies between groups 1 and 2 (-0.5**) and groups 1and 3 (-0.5**)	6.3* (d.f.=16) A significant difference in group means lies between groups 1 and 2 (0.2*) and groups 2 and 3 (-0.2*)
Physical working conditions (reward)	8.00** (d.f.=14) A significant difference in group means lies between groups 1 and 3 (-0.38*) and groups 2 and 3 (-0.33*)		
Responsibility for student progress (value)		5.0* (d.f.=11) (Significance lost in post hoc analyses)	
Work load (reward)	6.2* (d.f.=14) A significant difference in group means lies between groups 1 and 2 (0.5*)		
Work load (value)			5.5* (d.f.=16) A significant difference in group means lies between groups 1 and 3 (0.2*)

In three scales a linear relationship continued to best describe the association between teacher reports and teacher age (Table 6.41). For example, younger teachers value adequate workload to a higher degree than their older colleagues. This progressively gets less important as teachers get older. Younger teachers entering the profession may find it difficult to cope with the pressures they encounter and, therefore, see a manageable workload as important whereas older teachers have learned to cope with this component and, therefore, value it less.

Similarly a linear relationship between age and the physical working conditions rewards scale continues to be appropriate. Younger teachers perceived their working conditions to be less adequate but might adapt to them as they get older. There is also the possibility that concerns over physical working conditions, being related to resources and materials available, are the central focus of a new teachers' teaching lives but as they get older, this is replaced by other pressures possible more administrative in nature (Mendez Ferrada & Bernales Leiva, 1996).

In contrast to the linear relationships above, associations between age, the workload reward, valuation of career advancement and valuation of personal and professional development scales, do show a dip in middle aged (and more frequently mid career) teachers.

In the case of the workload reward scale, where perceptions drop in middle age to recover in teachers in later years, it may once again be suggested that greater amounts of administrative work, and associated pressures, begin to accumulate in mid career (Cornejo & Rodríguez, 1997). Teachers may, however, become resigned to their workload, have left the profession (Gutierrez Sanchez *et al.,* 1997) or have learnt to deal with their many responsibilities and pressures, by the time they reach the end stages of their career. This would explain the subsequent rise in the perceptions of workload in the oldest teacher group.

Previously, Physics teachers had not appeared to differ in their job satisfaction scales according to age but in this reanalysis their valuations were affected. In this subject, a linear relationship is suggested, older teachers valuing the opportunities for personal and professional development more highly. Teachers may, as they get older, and further

away in time from their pre-service training, be ready to refresh and/or improve upon their skills and begin to place value upon attaining this.

The relationships between job facet scales and age are to some extent subject specific, a decrease in the valuation of personal and professional development in middle aged Biology teachers being somewhat in contradiction to an increase in importance of this scale in Physics teachers of a similar generation. This lower valuation of this scale in the former could reflect a resignation to the low opportunities available for the attendance of development courses, and the like. Why differences in value system between subject teachers might occur is unknown but may indicate distinct opportunities being available to different subject teachers or that certain groups are more in need/desirous of professional development and related in-service training.

The importance placed upon career advancement showed the cited dip in middle age group teachers with early and final group individuals significantly reporting this to be more important to them. Cornejo & Rodriguez (1997) explain the decrease in satisfaction in mid career in terms of teachers beginning to realise that the opportunities for career change (and perhaps progression) are limited. A dip in the valuation of career advancement may reflect teachers' attempts to adjust to this reality. They appear to value career advancement more as they get older perhaps because they may have acquired some of the few promotion opportunities by this stage and value these positions.

It has been proposed that the U shaped relationship between age and teacher scales occur when the job characteristics is more under the control of the organisation, linear relationships being shown in intrinsic job components under the control of the individual to a larger extent (Kacmar & Ferris, 1989). No such trend was immediately evident in the data presented here (Table 6.41), the characteristics of significance being all extrinsic in nature and both linear and U shaped relationships with the age variable being suggested.

It should be briefly mentioned at this juncture that the value placed upon a job component may well influence the perception of the quantity of the characteristic present. Interactions between value and rewards scales and their combined influence upon overall feelings of satisfaction will be investigated in the following chapter.

The present chapter has been largely descriptive in nature aiming to outline the interrelations between student, school and teacher background characteristics and their association with the central variables of student outcome and teacher attitude.

Some of the main findings are as expected, municipal schools, for example, being associated with lower socio-economic status students, who appear to be less motivated and demonstrate poorer attitudes to science and the teacher. Their achievement and scores on ability tests are lower and this may be related to these poorer attitudes and, hence, attributable, or contributed to, by lack of motivation. It was surprising, therefore, that more relationships between school administration type and reports of teacher overall job satisfaction and job reward scales were not more evident, especially as differences were calculated between student perceptions of teacher satisfaction and school administration. This suggests that student perceptions may not be particularly accurate. Students of higher ability tended to perceive their teachers as satisfied but reasons for this were not forthcoming.

Teachers working in La Serena, and in more affluent schools registering students of higher socio-economic status, are more likely to be working in a single institution, a fact that may be influential in better student achievement, if working in one institution is related to greater involvement and commitment to the school. Teachers who spend longer hours in the school are more likely to perceive their conditions as more favourable, take on more responsibilities and form better relationships with management. Although this may increase their workload, it is likely that they are more involved and committed to the institution which may enhance their own satisfaction or even student outcomes. An interest in developing personally and professionally within this career may encourage teachers to commit to one school so these opportunities may be more available to them. Based on the advantages associated with teacher commitment to one school, it is recommended that schools phase out the hourly pay practice and offer teachers full time contractual employment. This should increase their involvement and identification with the school and improve student outcomes in the long term.

Although commitment to one institution at a time is desirable, prolonged service at the school may be less so, as perceptions of relationships with colleagues and workload

begin to decrease with length of service to school. The novelty of new establishments and the prevention of stagnation within a career might be, therefore, of benefit to teachers both in their career and work enjoyment. This is not in line with some studies (Leana & Van Buren, 1999) where job tenure and stability is suggested as a means of improving co-operative action between fellow workers.

Differences in student and teacher attitudes in the three subjects are not clear, although judging from the interactions observed, Biology and Chemistry appear to have more in common than either have with Physics. Research is again required to determine if subject differences are worth considering further and what the reasons behind these may be.

Both student attitudes and achievement in Biology is better than in the other subject areas. Why Biology students may have better attitudes and achievement is not further explained by this data and future investigation into subject differences must be recommended.

Negative relationships between student age, on the one hand, and student attitudes and achievement on the other, and between student age and two teacher reward scales, suggest that student repetition is not the answer to improving student outcomes. It, in fact, may cause a deterioration in the approach to the subject and their teacher, a fact that is likely to influence the teacher themselves and their work.

When teacher attitudes were considered, overall satisfaction was higher than expected. This may be attributed to the nature of the science discipline rather than a view of consensus across all subject teachers. Issues appear to arise in Chile with reference to low opportunities for career advancement and personal and professional development specifically. Scarcity in material rewards is an issue as might be expected. Although teachers may modify their value systems in such a way as to justify remaining in such a poorly paid profession, it would seem that adequate remuneration is still important, as is career advancement. The observation that valuation of career advancement and material rewards is high, but perceptions thereof low, identifies the potential of these two job facets as sources of teacher dissatisfaction.

There is some indication that male and female teachers may expect and experience different things from and within the profession. Furthermore, although older teachers appear to be more satisfied with some components of their profession, there is a tendency for mid career teachers to report inadequacies in some areas. Recommendations are, therefore, that younger teachers are assisted to a greater degree in the initial pressures they encounter when entering the profession. These pressures are possibly due to the conflict between their expectations and training and the reality of the school. Assistance must not cease here, however, as mid career teachers face crises of their own, work load being one area needing attention. These latter teachers appear to lower their valuations of career advancement and personal and professional development (in Biology), which may be related to the lack of opportunity to participate in such activity. Development of greater opportunities for a career ladder and in-service training is again recommended.

Location of the school would seem to be a necessary issue to address also, as student achievement, attitudes and perceptions and teacher perceptions vary between the two regions. A better understanding of the differences between Coquimbo and La Serena would need to be achieved before these results are confirmed.

The initial, although preliminary explanation made above, will be elaborated in following chapters.

CHAPTER 7 CONTRIBUTION OF INDIVIDUAL JOB CHARACTERISTICS TO OVERALL JOB SATISFACTION

In the previous chapter, descriptions of levels of overall job satisfaction and the perceptions and evaluations of individual job characteristics were presented. The central focus of this chapter is to now gain an understanding of the contribution of these latter reward and value scales to overall job satisfaction. An outline of these objectives is summarised in Part E, Figure 4.03 (Chapter 4). Interactions between job characteristics are also considered.

7.1. Relationships between different teacher reward scales

Before considering the relationships between job characteristics and overall job satisfaction, it is of interest to observe similarities between teacher reports on job characteristics. This creates a clearer picture of how teachers view their work and also allows an awareness of the colinearity between variables in the regression analyses that follow. Bivariate correlations between teachers' perceptions of job rewards (Table 7.01) and values (Table 7.02) were calculated to achieve this. The total teacher sample was used in this analysis.

Table 7.01: Correlations between job characteristic reward scales

Job Dimension	Administrative responsibility	Career advancement	Community-School relations	Management and morale	Material rewards	Personal and professional development	Physical working conditions	Relationships with colleagues	Responsibility for student progress	Student characteristics	Work content	Work load
Administrative responsibility	1.0											
Career Advancement	0.2	1.0										
Community–School relations	0.1	0.5***	1.0									
Management and morale	0.2	0.5***	0.4*	1.0								
Material rewards	0.2	0.6***	0.5**	0.6***	1.00							
Professional and personal development	0.6***	0.1	-0.1	0.0	0.2	1.0						
Physical working conditions	0.2	0.5***	0.5***	0.3*	0.4**	0.0	1.0					
Relationship with Colleagues	0.3	0.6***	0.5**	0.6***	0.5**	0.1	0.4**	1.0				
Responsibility for student progress	0.6***	0.3*	0.3*	0.2	0.3	0.6***	0.3*	0.5**	1.0			
Students' characteristics	0.1	0.1	0.3*	0.4*	0.4*	0.0	0.1	0.1	0.0	1.0		
Work content	0.1	-0.0	-0.1	0.2	-0.1	0.1	-0.2	0.1	0.1	0.0	1.00	
Work load	0.1	0.0	0.0	0.0	0.2	0.2	0.1	0.2	0.2	0.1	-0.2	1.0

Few scales were completely independent of the others, reports on workload and the content of work being the only two scales unrelated to any other. It is reassuring to note that intrinsic enjoyment of the job or work content is not influenced by other characteristics, especially more extrinsic ones such as physical working conditions. It is somewhat surprising, however, that this and the experience of workload is by no means alleviated or exacerbated by such characteristics. The effects may be indirect and not detectable in a direct correlational analysis.

Career advancement, community-school relations, management and morale, material rewards, responsibility for student progress, relationship with colleagues and physical working conditions were scales most commonly related to other scales. Perceptions of student characteristics, administrative responsibilities and personal and professional development opportunities were less so.

Many of these associations can be rationalised. High correlations, for example, lay between the management and morale scale and relationships with colleagues (r=0.6), career advancement and relationships with colleagues (r=0.6) and career advancement and material rewards (r=0.6). Teachers reporting there to be better opportunities for career advancement are likely to have taken advantage of this and be experiencing the associated improved material rewards linked with higher positions. Furthermore, those that feel career advancement is fairly handled and available are less likely to feel resentful of colleagues that may be involved in this process. Colleagues are also likely to be members of the management and good relationships with the management may follow on from good relationships with colleagues.

Involvement in administrative responsibilities was associated with participation in activity revolving around student progress (r=0.6). This suggests that teachers involved with events outside the classroom are likely to participate in a range of activities centred both around and apart from the student and be partial to taking on extra responsibility in general. Additionally, teachers who see professional and personal development as adequate report themselves as more involved in both types of responsibility (r=0.6 respectively), indicating perhaps that if in-service training has been made available to them, they are encouraged to become active members of the school outside the classroom.

Reasons for other correlations are less evident. It may be that unhappiness with certain characteristics induces general dissatisfaction that indirectly colour teachers' judgement of other characteristics. Discontent with physical working conditions, for example, may inhibit a teacher's ability to interact with his colleagues or take on additional responsibility. Some, relationships, however, may be attributable to chance alone, e.g., between management and morale and material rewards (unless management is responsible for salary setting as may be the case in private institutions) or between community school relations and career advancement.

Finally, there is the danger that despite efforts to make scales clear and distinct (through previous factor analysis and intuitive allocation of scale items) teachers are pattern responding or unable to make clear distinctions between scales, a fault that would require additional instrument development.

7.2. Relationships between teacher value scales

As above, bivariate correlations between the values placed upon the differing job characteristics are made and displayed in Table 7.02.

Table 7.02: Correlations between job characteristic value scales

Job Dimension	Administrative responsibility	Career advancement	Community-school relations	Management and morale	Material rewards	Personal and professional development	Physical working conditions	Relationships with colleagues	Responsibility for student progress	Student characteristics	Work content	Work load
Administrative responsibility	1.0											
Career Advancement	0.2	1.0										
Community–School relations	0.4*	0.4**	1.0									
Management and morale	0.2	0.4**	0.5**	1.0								
Material rewards	0.1	0.6***	0.5**	0.5**	1.0							
Professional and personal Development	0.5**	0.3*	0.4**	0.4**	0.4*	1.0						
Physical working conditions	-0.1	0.4**	0.3*	0.4*	0.3	0.1	1.0					
Relationship with Colleagues	0.5**	0.6***	0.6***	0.5***	0.6***	0.6***	0.2	1.0				
Responsibility for student progress	0.5**	0.1	0.5**	0.2	0.1	0.5***	-0.1	0.5***	1.0			
Students' characteristics	0.3*	0.3*	0.5**	0.4**	0.4*	0.4*	0.2	0.4**	0.1	1.0		
Work content	-0.0	-0.0	0.2	0.3	0.1	0.1	0.1	0.2	-0.0	0.6**	1.0	
Work load	0.1	0.4*	0.4*	0.3*	0.4*	0.3	0.3	0.3*	0.1	0.5**	0.3	1.0

A slightly greater number of relationships between the valuations placed upon job characteristics were found if compared to those associations calculated between the reward scales. This may partly be explained by tendencies previously noted of teachers to report all characteristics of high and relatively equal importance. It may also testify to the presence of some general value system upon which teachers base their individual values. Due to this common internal base, interrelatedness between values is to be expected, far more so than could be anticipated for the interrelatedness of perceptions of the work reality, a reality external to the teacher, although subjectively interpreted.

It was interesting to note that, where the perception of workload had been uncorrelated with other job characteristics in the reward scales, when it came to value scales, significant, albeit weak to moderate, interconnections between this scale and others were detected. A clear connection could now be made between the valuation of a reasonable workload and the scales such as career advancement and material rewards. The association may be attributable to the latter argument of the existence of some central value system that is drawn upon to determine the value placed upon quite distinct job attributes although the exact theme of this system is harder to identify.

The valuation of the work content scale remains largely independent of other values but demonstrates a single correlation with the importance placed upon the characteristics of students. As this is the one other scale that is intrinsic in its nature it may be suggested that if teachers hold a general value system where the intrinsic nature of the job is important, then they will probably draw from this central system and report on both the student characteristics and work content scale in similar ways. A large amount of the work content is also likely to derive from working with students, so again the correlation is not a surprising one.

One of the highest correlations occurred between the importance placed upon career advancement and material rewards ($r=0.6$). Teachers that value prestige as well as economic gain are likely to see both these characteristics as important.

Another moderate to strong correlation ($r=0.6$) occurred between the value placed upon relationships with colleagues and the scale representing community-school relations. This indicates that teachers that value good relationships with other people in general

are likely to value both these two scales, as each describes part of the job that involves interacting with adult members of society whether within or outside the school.

Indication of a strong relationship between the values placed upon material rewards and relationships with colleagues (r=0.6) was less obvious in its logic and these characteristics may be related to some third characteristic unmeasured in this study.

It was hoped that the correlations of reward and value scales presented above (Tables 7.01 and 7.02) would point to some underlying grouping of job characteristics to which teachers might make similar reports. This could improve upon the work conditions/roles and responsibilities dichotomy presented in the TPS framework (Figure 2.03). If sample sizes had been greater, a cluster or factor analysis of job characteristics may have assisted to identify this structure. To initiate identification of clusters from the present sample, however, the higher correlations (above 0.6) between reward and value scales, respectively, were grouped and summarised in Figures 7.01 and 7.02.

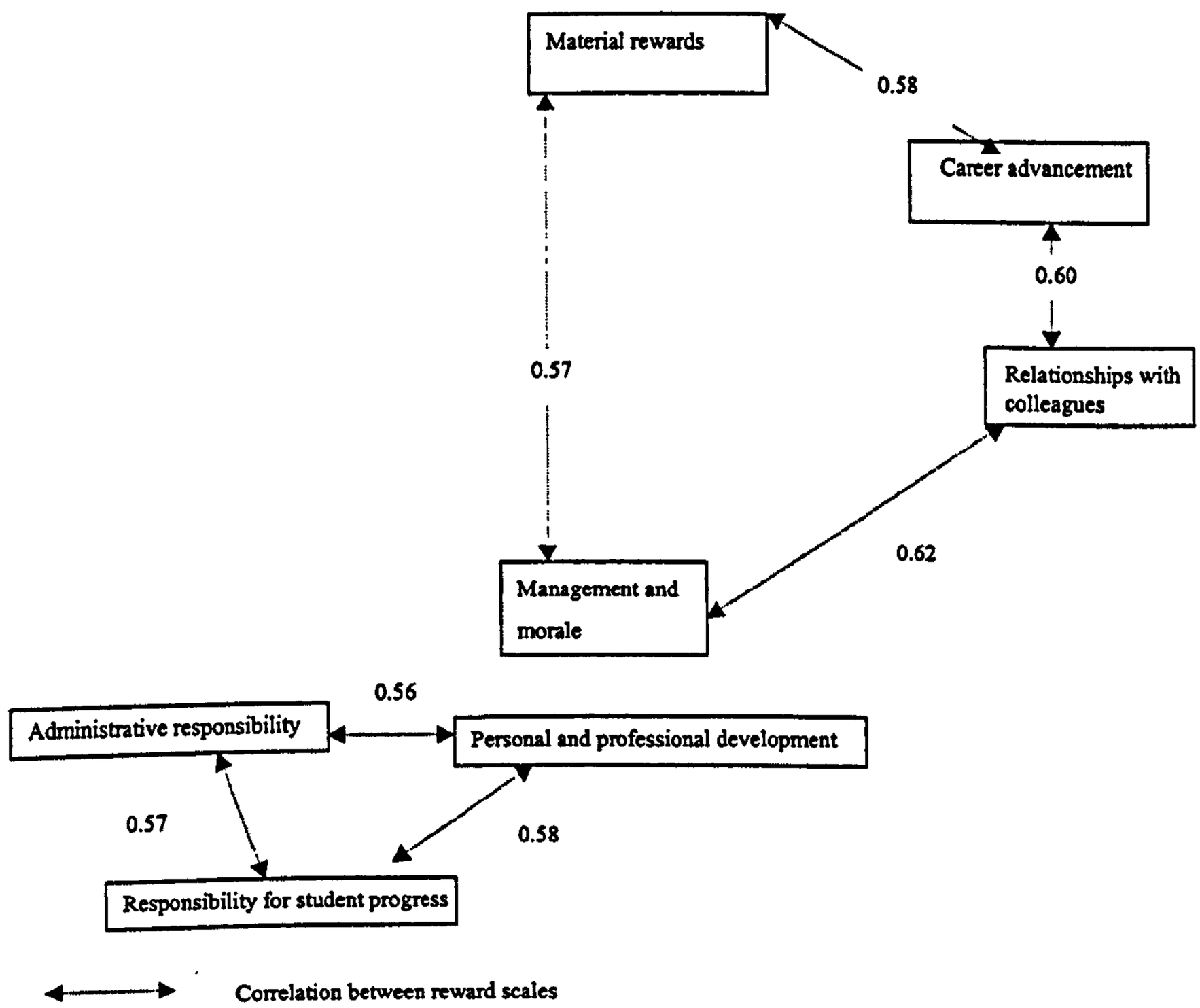


Figure 7.01: Grouping of reward scales.

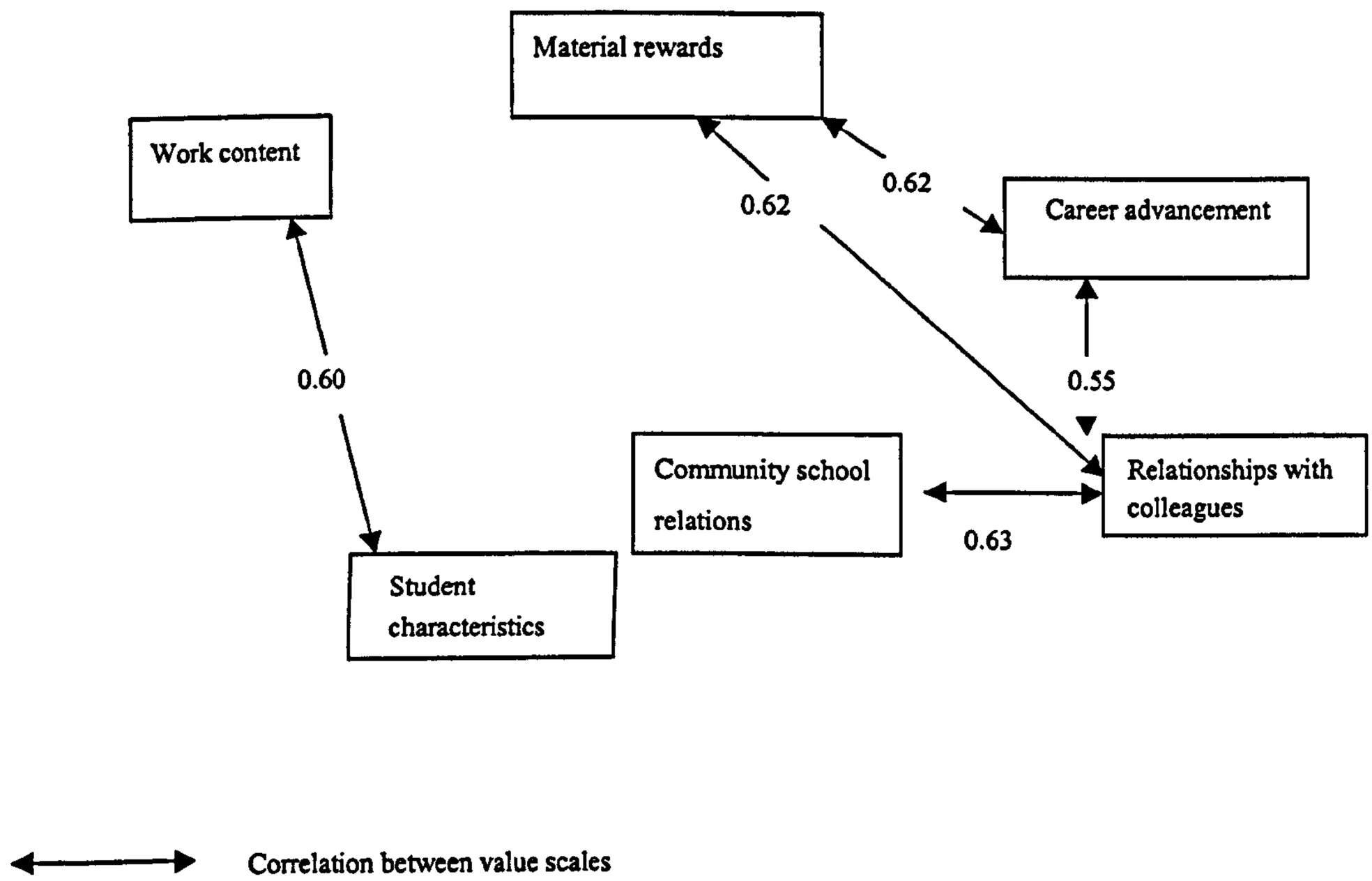


Figure 7.02: Grouping of value scales

In the groupings of values (Figure 7.02), "work content/student characteristics" and "material rewards/career advancement/relationships with colleagues/community-school relations" scales appear to be inter-linked suggesting that the original working conditions dimension of the TPS study may be sub-categorised, when considering value scales, into an intrinsic characteristics group and an ambition/human interaction group (Figure 7.02), two central and separate values systems held by the individual teacher.

In the grouping of rewards, (Figure 7.01) two groups would again appear to form, namely the "personal and professional development/responsibility for student progress/administrative responsibility" group and the "management and morale/relationships with colleagues/material rewards/career advancement" set. The first group is in keeping with the roles and responsibilities job characteristic cluster already presented in the TPS research (Menlo & Poppleton, 1990) as a dimension of employment. An ambition/working with people dimension, as for the value scales (Figure 7.02), may again be proposed.

These groupings have given the job components under study some structure indicating the possibility of "intrinsic", "ambition/human relations" and "roles and responsibility"

dimensions within the list of job characteristic variables. The exclusion of several job attributes, however, makes the clusters reported of only limited improvement on the work conditions/ roles and responsibilities categories presented in the TPS study.

7.3. Contribution of reward and value scales to overall job satisfaction

The aim of this section of analysis was the determination of the individual job characteristics that are most associated with overall feelings of job satisfaction in the science teacher. This is of general interest as one assumes that the location and maximisation of key job characteristics will in turn optimise the overall feeling of satisfaction and well being experienced by the teacher, in itself a worth while goal. It is of particular interest to this study, however, as those job characteristics most associated with overall job satisfaction, will be shown to be associated with student outcomes also. Maximisation of these facets will not only improve teacher overall satisfaction, therefore, but student outcomes as well.

It has been argued that feelings of satisfaction are an association between how much a characteristic is believed to be present (reward) and the value placed upon the same characteristic (Kalleberg, 1977). The question arises as how to combine values and rewards in the most effective manner, so that their contribution to overall job satisfaction is most accurately represented.

Two main equations and their associated components will be tested here. The first equation represents an additive linear regression, recommended by the Kalleberg (1977) and Poppleton (1989) studies (Equation 2.02, Chapter 2). Value and reward scales are seen as variables independent of each other, contributing to overall job satisfaction based upon separately calculated weightings.

Both Kalleberg (1977) and Poppleton (1989) also consider the possibility that value is not an independent variable, as described in equation 2.02, but contributes to overall job satisfaction through influencing teachers' perceptions of the job characteristics, i.e., the perception of a characteristic is altered by the valuation placed on this by the individual. An interaction variable between rewards and values is, therefore, included. This supposition was described by the equation 2.03 (Chapter 2).

The results of 5 different regressions are presented to facilitate both a comparison between equations 2.02 and 2.03 and the choice of the most appropriate model with which to establish a suitable hierarchy of job characteristics most likely to lead to improved overall job satisfaction in Chilean science teachers. Overall job satisfaction, therefore, was regressed onto:

- Rewards only (represents the supposition that value measurements are already incorporated fully in the measurement of reward)
- Values only
- Rewards and values combined as in equation 2.02
- Rewards*value (variable measuring interaction between rewards and values)
- Rewards and rewards*value combined as in equation 2.03

7.3.1. Rewards only

The association of job rewards alone, with the overall job satisfaction scale, was determined by regressing overall satisfaction onto the job reward for each job characteristic. The results of such an analysis can be seen in Table 7.03. Column 1 represents the standardised β coefficients produced from a regression of overall job satisfaction onto each job characteristic reward individually. Column 2 represents the standardised β coefficients, a product of the regression of overall job satisfaction onto all job characteristic rewards simultaneously, done in an attempt to place into a hierarchy the influences of each job characteristic. Column 3 represents a *stepwise* regression of all the reward variables simultaneously so that the most contributory of the characteristics could be isolated.

Table 7.03: Coefficients describing the relationships between rewards and overall job satisfaction

	1	2	3
DIMENSION	**Standardised β coefficients of overall job satisfaction regressed onto each job reward individually**	**Standardised β coefficients of overall job satisfaction regressed onto each job reward simultaneously**	**Standardised β coefficients of overall job satisfaction regressed onto each job reward simultaneously (Stepwise regression)**
Administrative responsibility	0.2	-0.2	
Career Advancement	0.5***	0.1	
Community–School relations	0.4*	0.0	
Management and morale	0.5***	0.2	
Material rewards	0.5**	0.2	0.3*
Physical working conditions	0.4*	0.1	
Professional and personal Development	0.3	0.3	
Relationship with Colleagues	0.6***	0.3	0.5**
Responsibility for student progress	0.4*	0.0	
Students' characteristics	0.1	-0.0	
Work content	0.2	0.1	
Work load	0.2	0.1	
Percentage explainable variance (R^2 X100%)		52.6	42.1

When rewards are regressed individually, all scales within the ambition/human relations dimension are linked to overall job satisfaction. Only the responsibility for student progress scale of the roles and responsibilities dimension was similarly associated. Physical working conditions, a more independent job characteristic scale, that had not fallen into any main job dimension, also was related to overall job satisfaction. All the relationships are positive, indicating that the more the job characteristic is perceived to be present by the teacher, the more it will contribute to overall job satisfaction.

When all characteristics are regressed simultaneously no individual scale stands out above all others as contributing significantly to the variance in overall job satisfaction. Moderate correlations between several of the job facets may account for this (Table 7.01). When a stepwise regression is performed on the scales simultaneously the material reward and relationship with colleagues scales stand out in their significant contribution to overall job satisfaction. This indicates that, according to an analysis

where only teachers' perceptions of their job characteristics are measured, improvement in the processes of collegial interaction as well as improved material reward input into the profession, are likely to be the keystone in improving teacher job satisfaction in general.

7.3.2. Values only

Similar analyses that consider the association between overall job satisfaction and the value placed on each job characteristic are presented in Table 7.04. The columns represent the same analyses as described in the previous Table (Table 7.03)

Table 7.04: Coefficients describing the relationships between values and overall job satisfaction

	1	2	3
DIMENSION	**Standardised β coefficients of overall job satisfaction regressed onto each job value separately**	**Standardised β coefficients of overall job satisfaction regressed onto each job value simultaneously**	**Standardised β coefficients of overall job satisfaction regressed onto each job reward simultaneously (Stepwise regression)**
Administrative responsibility	0.3	0.3	No characteristic stands out as significant
Career Advancement	-0.2	-0.3	
Community–School relations	0.1	0.0	
Management and morale	0.2	0.3	
Material rewards	-0.1	-0.2	
Physical working conditions	-0.1	-0.1	
Professional and personal development	0.1	-0.2	
Relationship with colleagues	0.2	0.4	
Responsibility for student progress	0.3	-0.0	
Students' characteristics	0.0	-0.2	
Work content	0.0	0.0	
Work load	0.0	0.2	
Percentage explainable variance (R^2 X 100%)		27.1	

No significant relationship was found between the valuation of any of the job characteristics and overall job satisfaction. This leads one to question the relevance of including this component in the measurement instrument, at least as an independent variable contributing to overall job satisfaction. Attach the latter to concerns already expressed on lack of variation and skewness in the distributions of value measurements

(Appendix 11), and the inclusion of values in satisfaction measurement becomes suspect.

The size of the sample, however, may be limiting the number of relationships that reach significance. If one chooses to first consider some of the stronger relationships shown (Table 7.04; $\beta>0.2$) one finds that two values from the ambition/human dimension (relationships with colleagues and career advancement), as well as the more independent management and morale value scale, are of relevance. The importance placed upon having administrative responsibility and responsibility for student progress seem particularly important. Relationships are, with one exception, positive in direction. This demonstrates that the more these characteristics are valued the more the teacher will be likely to experience overall job satisfaction. In contrast, the more important a teacher feels career advancement to be, the less likely are individual values to be fulfilled, leading to disappointment and a reduction in overall job satisfaction.

If a general review of the signs of the relationships shown in Column 1 (Table 7.04) is made, regardless of the strength of the relationship, it is tempting to suggest that those characteristics over which the teacher, in the Chilean context, may have little control and/or are little present, such as career advancement, material rewards and physical working conditions, cause dissatisfaction if too much importance is placed upon them. Alternatively, those over which teachers have more direct control, such as the responsibilities in which they are involved and the relationships they form with colleagues, will cause, if valued highly, more satisfaction. The importance placed upon work content, work load, student characteristics, community-school relations and personal and professional development, are ignored in this discussion, their contribution to overall job satisfaction being virtually negligible.

7.3.3. Rewards and values combined as in equation 2.02

In the analyses described in sections 7.3.1 and 7.3.2, rewards and values are considered as separate entities. The combination of the two is now considered. In a first approach (Table 7.05), values and rewards are treated as separate and independent variables in their joint contribution to overall job satisfaction (equation 2.02, Chapter 2).

In this model:

> "...if a job attribute is highly valued but absent, job satisfaction will be low; if it is both valued and present, job satisfaction will be high. If, on the other hand, an attribute is not valued, then its presence or absence will make no difference to the level of job satisfaction experienced" (Poppleton, 1989; p78).

Value and reward ratings are compared in Figure 7.03 where it can be observed that teachers rate all characteristics with a greater importance than they rate the amount of that characteristic to be present (reward).

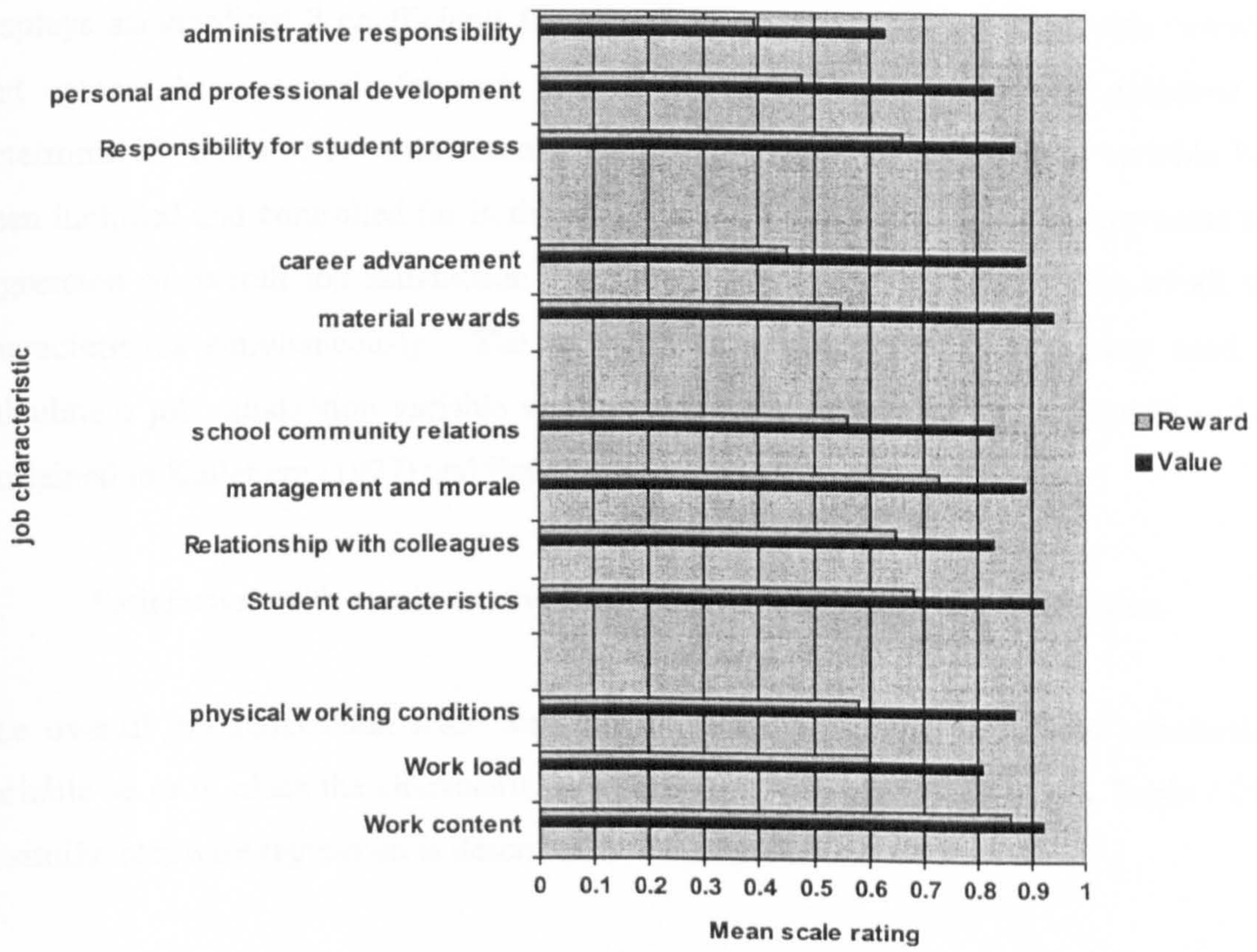


Figure 7.03: Bar chart comparing mean reward and value ratings for each job characteristic

From a visual review of the scales (Figure 7.03) it would seem that both career advancement and material reward scales as well as the personal and professional scale represent components of teaching that are likely to contribute to teacher dissatisfaction. This suggestion is based upon the observation that the valuation of each of these characteristics is high but the associated reward scale is rated much lower (differences

between mean ratings of reward and value over 0.3 were considered worthy of comment). At the other end of the spectrum, the work content scale would seem likely to augment satisfaction as both reward scales and value scales rate highly. A scale such as administrative responsibility where valuation and rewards are both rated low is an example of a scale that could be expected not to contribute to overall satisfaction in any way, either positive or negative.

Column 1 (Table 7.05) shows the correlation between value and reward scales of each job characteristic which gives an indication of the extent to which the value measurement may already be reflected in the reward scale. Column 2 (Table 7.05) displays standardised β coefficients for overall job satisfaction regressed onto rewards and values *simultaneously* for each individual characteristic. This was achieved to determine if values or rewards retained their significance once the other variable had been included and controlled for in the analysis. Column 3 (Table 7.05) represents the regression of overall job satisfaction upon the rewards and value variables of all the characteristics simultaneously. The raw β coefficients presented here are used to calculate a job satisfaction variable via the additive equation 2.02 (Chapter 2) and as explained in Kalleberg (1977) and Poppleton (1989), e.g.,

Satisfaction with administrative responsibility=-0.2*Reward+0.3*Value.

The overall job satisfaction scale was then regressed onto the calculated satisfaction variable so as to place the characteristics in order of influence (Column 4, Table 7.05). A similar stepwise regression is described in Column 5.

Table 7.05: Coefficients describing the relationships between rewards, values and overall job satisfaction (Equation 2.02)

	1	2	3	4	5
DIMENSION	**Correlation between rewards and values**	**Standardised β coefficients (for each dimension)**	**Non-standardised β coefficients (across all dimensions) (for each dimension)**	**Standardised β coefficients (for calculated individual characteristic satisfaction)**	**Standardised β coefficients (for calculated individual job characteristic satisfaction) (Stepwise regression)**
Administrative responsibility					
Reward	0.6**	0.1	-0.2	0.2	
Value		0.3	0.3		
Career Advancement					
Reward	0.2	0.6***	0.0	0.4**	0.4**
Value		-0.3	-0.5		
Material Rewards					
Reward	0.2	0.6***	0.2	0.2	0.3*
Value		-0.2	0.1		
Professional and personal development					
Reward	0.3	0.3	0.2	0.2	
Value		-0.0	0.1		
Responsibility for student progress					
Reward	0.6**	0.4	-0.0	0.4*	
Value		0.0	-0.4		

Table 7.05 (Continued)

Community–School relations					
Reward	0.2	0.4*	-0.1	0.1	
Value		0.0	0.1		
Management and morale					
Reward	0.6**	0.7***	0.1	0.1	
Value		-0.3	-0.2		
Relationship with Colleagues					
Reward	0.5**	0.7***	0.6*	0.7***	0.5***
Value		-0.2	-0.0		
Students' characteristics					
Reward	0.3	0.2	0.0	0.1	
Value		-0.1	-0.2		
Physical working conditions					
Reward	0.3	0.4**	0.3	0.3*	0.3*
Value		-0.3	-0.2		
Work content					
Reward	0.7**	0.3	0.7*	0.4**	0.3**
Value		-0.1	-0.6		
Work load					
Reward	-0.1	0.2	-0.1	0.2	
Value		0.1	0.2		
Percentage Explainable variance (R^2 X 100%)				72.0	61.8

Positive significant relationships between rewards and values (Column 1, Table 7.05) were found in the work content, relationships with colleagues, management and morale, responsibility for student progress and administrative responsibility scales.

Positive relationships between rewards and values in the responsibility for student progress scale may relate to the possibility that teachers have some control over whether they participate in these activities. This is suggested by Poppleton (1989) who makes similar findings concerning reward/value relationships in these scales. If teachers value these activities they will make efforts to become involved in them and, hence, the observed convergence between reward and value ratings. Alternatively, the attainment of the reward may precede the valuation, as participation in certain activities may generate a positive valuation of the activity in retrospect (Poppleton, 1989).

Professional and personal development also showed a positive correlation but, unlike in the Poppleton study, this did not prove to be significant. This suggests that the opportunity to be involved in personal and professional developmental activity in schools in Northern England is unproblematic and is a matter of choice and interest. The importance placed upon the job attribute and the whether this attribute is present in the job, therefore, converge. In the La Serena/Coquimbo area of Chile, however, such activity is not so readily available and although there might be a desire to participate, the opportunity to do so may not be there. This lesser control over acting upon a value held concerning personal and professional development causes valuations and actual perceived rewards to diverge.

Positive interaction between the valuation of collegial relationships and the achievement thereof was found both in this thesis and the Poppleton study. Several interpretations can be made of these findings. If one believes that values precede the acquirement of the reward and that teachers have some control over acquiring the said characteristic, (i.e., teachers try actively to get on and work with their fellow teachers), it might be assumed that those who value good collegial relationships will make a concerted effort to interact well with fellow staff and have some degree of success. If valuation follows on from the acquisition of a reward then if the climate amongst teachers is pleasant, teachers may value this more. If inadequate then, in the form of self-defence, the teacher may declare collegial relationships to be unimportant to him.

Similar arguments could be made for positive relationships found between the reward and value components of the management and morale job characteristic, a relationship which had not been detected in the English research (Poppleton, 1989). This suggests that teachers in Chile may be better able to negotiate good relationships with management in accordance with their value systems. Perhaps teachers involved in management are more likely to have a greater teaching commitment in Chile and remain 'teaching colleagues' whereas those in England may slowly leave the teaching arena behind as they progress up the management hierarchy.

When overall job satisfaction is regressed onto reward and value scales simultaneously for a particular characteristic (Column 2, Table 7.05) the contribution of rewards to overall job satisfaction remains evident. The same reward scales found to be significant when rewards alone were analysed retain this significance with the exception of the responsibility for student progress scale that just lost significance. Value variables change more markedly, however, although significant relationships with overall job satisfaction still fail to appear. This once again leads to conclusions similar to those of Poppleton (1989) that, methodologically, value measures might be ignored.

Based on a simultaneous regression of calculated satisfaction variables (as calculated from the β coefficients in Column 3, Table 7.05) onto overall job satisfaction (Column 4, Table 7.05), contentment with the following are connected significantly (in order of importance) to teacher overall job satisfaction:

Relationships with colleagues
Career advancement
Responsibilities for student progress
Work content and
Physical working conditions

Although no values are significant in the regression calculations, their inclusion into the final satisfaction variable in Column 4 (Table 7.05) does increase the percentage of explained variance from 52.6% to 72.0% a fact that for this sample, despite the expressed reservations, encourages the continued consideration of value measurements. In stepwise regression, results were similar although responsibility for student progress

loses its significance to be replaced by the material reward scale that lies between work content and physical working conditions in importance.

7.3.4. Reward*value interaction

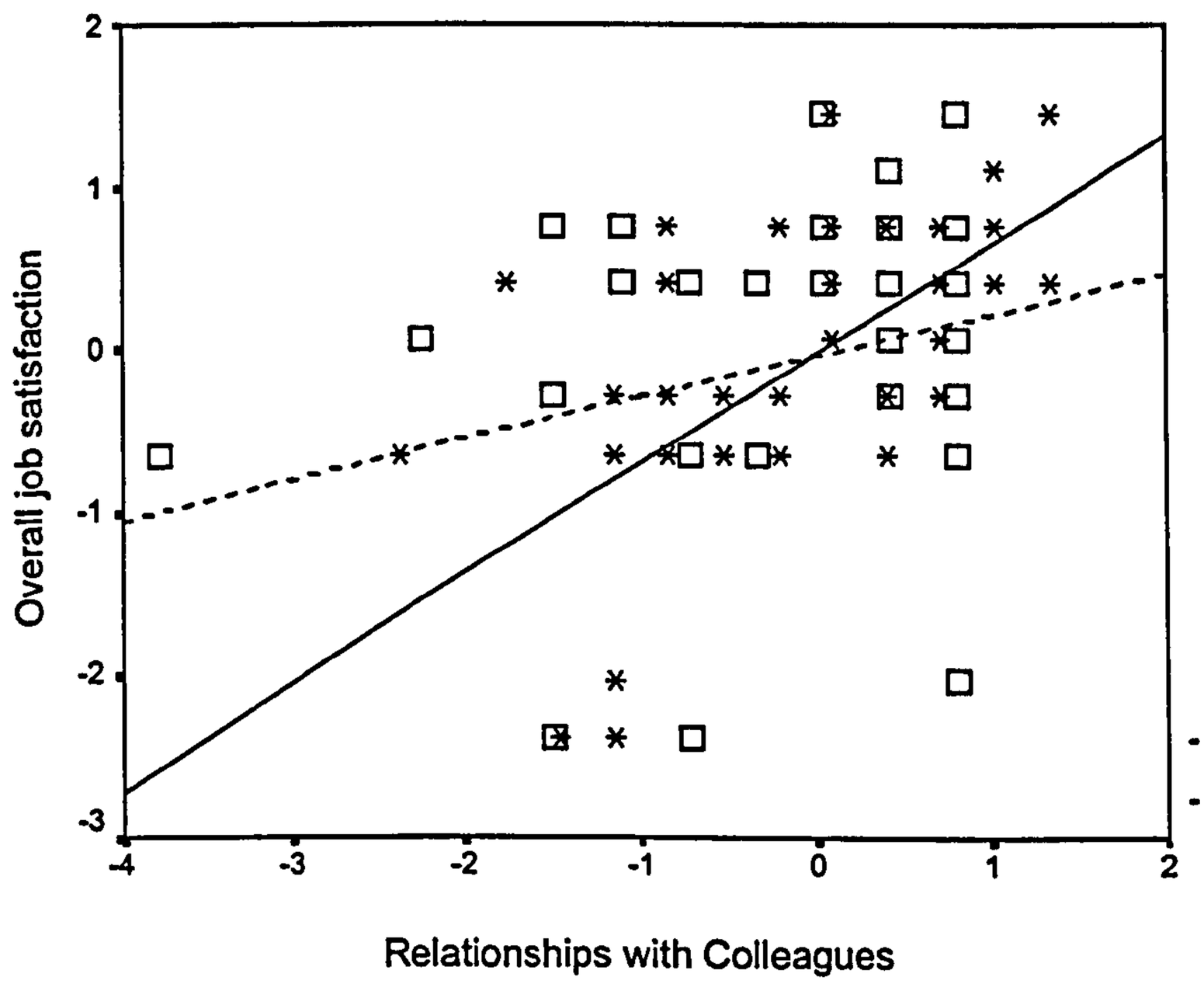
The influence of the reward*value variable (as an indicator of a reward-value interaction) upon the overall job satisfaction scale, was determined by regressing overall satisfaction first onto each job reward*value variable individually (Column 1; Table 7.06) and then collectively (Column 2; Table 7.06). The results of a stepwise regression on all the characteristics simultaneously is displayed in Column 3 (Table 7.06).

Table 7.06: Coefficients describing the relationships between rewards*values and overall job satisfaction.

	1	2	3
DIMENSION	**Standardised β coefficients of overall job satisfaction regressed onto each reward*value separately**	**Standardised β coefficients of overall job satisfaction regressed onto each reward*value simultaneously**	**Standardised β coefficients of overall job satisfaction regressed onto each reward*value simultaneously (Stepwise regression)**
Administrative responsibility	0.2	-0.2	
Career Advancement	0.5**	0.1	
Community–School relations	0.4**	0.1	
Management and morale	0.5***	0.3	0.3*
Material rewards	0.4**	0.1	
Physical working conditions	0.3*	0.0	
Professional and personal Development	0.3	0.2	
Relationship with Colleagues	0.5***	0.2	0.3*
Responsibility for student progress	0.4*	0.1	
Students' characteristics	0.1	-0.1	
Work content	0.1	0.0	
Work load	0.2	0.1	
Percentage Explainable variance (R^2 X 100%)		42.2	34.4

When regressed alone, the reward*value variables of career advancement, relations between community and school, management and morale, material rewards, physical working conditions, relationship with colleagues and the responsibility for student progress relate significantly to overall job satisfaction, indicating that in the mentioned

job characteristics, an interaction between reward and value contribute significantly to overall job satisfaction. However, when regressed simultaneously, the significance disappears. Stepwise regression performed simultaneously for all characteristics shows that the most predominant interaction between reward and value scales occurred in the relationships with colleagues and the management and morale scale (Figures 7.04 and 7.05), respectively. Although the fact that few interactions are found is in agreement with Poppleton (1989), she found that interactions occurred elsewhere, namely in the material rewards scale and a separate scale measuring the pastoral responsibilities of the teacher.

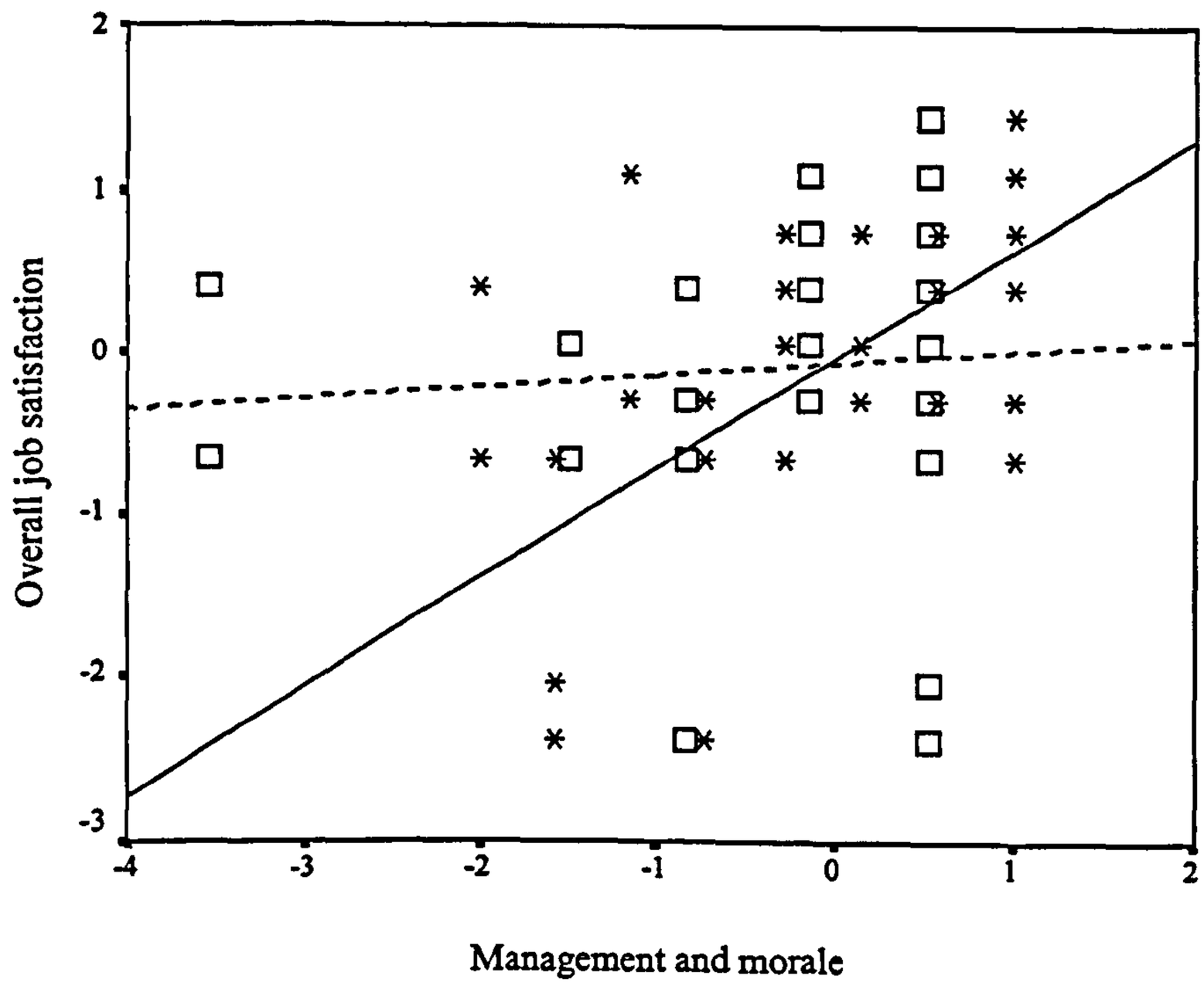


***_____Value scale (z-score)**

□_____Reward scale (z-score)

Figure 7.04: Interaction between rewards and values in relationship with colleagues scale.

A graphical representation of the relationship between overall job satisfaction and the relationship with colleagues job attribute, demonstrating the interaction between reward and value scales, is presented in Figure 7.04. Moderate levels of overall job satisfaction coincide with values that tend to exceed the reward scale measures at this point. However, when teachers report very high levels of overall job satisfaction, the perception of the presence of good relationships and interactions with colleagues exceeds the value levels placed upon them.



*————Value scale (z-score)

□————Reward scale (z-score)

Figure 7.05: Interaction between rewards and values in management and morale scale.

It is similarly found that the rewards and values interact in the relationship between overall job satisfaction and the management and morale scale, (Figure 7.05), i.e., again lower levels of overall job satisfaction are associated with higher valuations of management and morale if compared to the perception of the quality of such relationships. However, at higher levels of overall job satisfaction, the perception of this scale has exceeded the value placed upon it.

It would appear in both job characteristics that, at lower levels of overall job satisfaction, the lower rating of the characteristic exaggerates the value placed upon it. At high levels of overall job satisfaction, where reward scales are higher also, values, although improved, and of a lesser quantity than the reward, are not as depressed by the fulfilment of the reward to the extent that they are exaggerated when reward measures are found wanting. In other words, when relationships with colleagues or management are inadequate, teachers will exaggerate the value they place upon these conditions. One may refer back to commentary, therefore, made on the saliency of inadequate

conditions causing these characteristics to be more highly valued than if satisfactory and perhaps less salient.

7.3.5. Rewards and reward*value interaction as in equation 2.03

The interaction variable is added to the reward variable in agreement with equation 2.03. Column 2 (Table 7.07) displays standard β coefficients of overall job satisfaction regressed simultaneously onto rewards and rewards*values for each individual characteristic. The aim of this procedure was to determine the contribution of each reward*value variable when the reward variable was included and controlled for in the regression.

Column 3 (Table 7.07) represents the non standardised β coefficients for overall job satisfaction regressed onto the rewards*values and rewards of all characteristics simultaneously. This was done to produce weightings with which to calculate a job satisfaction variable for each job characteristic using equation 2.03, e.g.,

Satisfaction with career advancement = 0.3 * Reward – 0.4*(Reward*Value).

Overall satisfaction was then regressed onto the calculated satisfaction variable so as to place the job characteristics in order of predictive power (Column 4, Table 7.07). A similar stepwise regression is displayed in Column 5.

Table 7.07: Coefficients describing the relationships between rewards, rewards*values and overall job satisfaction (considering equation 3).

	1	2	3	4	5
DIMENSION	**Correlation between reward*value and reward**	**Standardised β coefficients (for each dimension)**	**Non-standardised β coefficients (across all dimensions) (for each dimension)**	**Standardised β coefficients (for calculated individual characteristic satisfaction)**	**Standardised β coefficients (for calculated individual characteristic satisfaction) (Stepwise regression)**
Administrative responsibility					
Reward	1.0***	0.2	0.0	0.1	
Rewards*value		0.0	-0.1		
Professional and personal development					
Reward	1.0***	0.3	0.1	0.2	
Rewards*value		0.0	0.0		
Responsibility for student progress					
Reward	1.0***	0.1	0.6	0.3	
Rewards*value		0.3	-0.7		
Career Advancement					
Reward	1.0***	1.0	0.3	0.3	
Rewards*value		-0.5	-0.4		
Material rewards					
Reward	1.0***	1	0.8	0.3*	0.4*
Rewards*value		-0.8	-0.4		
Community–School relations					
Reward	0.9***	-0.0	-0.6	0.3*	
Rewards*value		0.4	0.6		
Management and morale					
Reward	1.0***	0.8	0.6	0.2	
Rewards*value		-0.2	-0.5		
Relationship with Colleagues					
Reward	0.9***	0.8***	0.5	0.6*	0.4**
Rewards*value		-0.3	-0.0		
Students' characteristics					
Reward	1.0***	0.4	0.1	0.1	
Rewards*value		-0.1	-0.2		
Physical working conditions					
Reward	1.0***	0.9*	0.7	0.3*	
Rewards*value		-0.6	-0.6		
Work content					
Reward	1.0***	0.5	1.3	0.3**	
Rewards*value		-0.3	-0.8		
Work load					
Reward	0.9***	0.1	-0.1		
Rewards*value		0.1	0.2	0.1	
Percentage Explainable variance (R^2 X 100%)				67.8	46.1

When rewards are controlled for, all the rewards*value variables lose their significance indicating that an interaction effect variable between reward and values does not contribute significantly to an explanation of overall job satisfaction once reward variables have been taken into account. This again brings the requirement for a measurement of value in studies of overall job satisfaction into question. The inclusion of the reward*value variable does improve the percentage of explained variance (from 52.6% to 67.8%), however, if compared to a model where only rewards have been included but the increase is less than that explained by equation 2.02 (52.6% to 72.0%). Additionally, the high colinearity between reward and reward*value, shown by the high correlation coefficients between these variables (Column 1; Table 7.07) and the few significant interactions initially found, casts doubt on the usefulness of this particular model (Table 7.06). It makes the choice of equation 2.02 the more appropriate in general discussion of the hierarchy of job characteristics in their influence on job satisfaction. Kalleberg (1977) and Poppleton (1989) both support the rejection of this interaction model based on reasons similar to those mentioned above.

Satisfaction with the following job characteristics, as calculated by equation 2.03, contribute significantly to overall job satisfaction:

Relationships with colleagues
Material rewards
Relations between community and school
Physical working conditions
Work content

Only the first two characteristics remain significant in stepwise regression.

7.3.6. Summary of results

Stepwise regression was employed for each analysis so as to draw out the variables of greatest contribution to overall job satisfaction at the expense of the lesser important characteristics.

The characteristics found to contribute significantly to overall job satisfaction in each model tested are presented in Table 7.08 by way of comparison.

Table 7.08: Prime contributors to overall job satisfaction (using stepwise regression)

	Rewards only (Standardised β coefficient)	**Values only (Standardised β coefficient)**	**Rewards*Values (Standardised β coefficient)**	**Equation 2.02** **Overall job satisfaction =** $a + \sum b_i R_i + \sum c_I V_I$ **(Standardised β coefficient)**	**Equation 2.03** **Overall job satisfaction =** $a + \sum b_i R_i + \sum c_i V_i R_I$ **(Standardised β coefficient)**
	Relationship with colleagues (0.5**)		Relationship with colleagues (0.3*)	Relationship with colleagues (0.5***)	Relationship with colleagues (0.4**)
	Material rewards (0.3*)		Management and Morale (0.3*)	Career Advancement (0.4**)	Material Rewards (0.4**)
				Work content (0.3**)	♦Physical Working conditions (0.2)
				Material rewards (0.3*)	♦Work content (0.2)
				Physical working conditions (0.3*)	
Percentage Explainable variance (R^2 X 100%)	42.1	0.0	34.4	61.8	46.1

♦Two Characteristics only just missed significance. Because of the size of the sample stepwise regression was rerun including the Characteristics by extending the significance limits to 0.1.

It can be concluded from the above analyses of different models that a teacher's perception of a particular job characteristic (reward) is the most important component of job facet satisfaction. This finding is in accordance with the opinion of Kalleberg (1977) and Poppleton (1989), the latter author concluding that:

"...job satisfaction in teaching appears to be reward driven" (Poppleton, 1989; p92).

Although, Poppleton (1989) puts forward the idea that the use of rewards alone may be sufficient, the present analysis would suggest that, although values do not contribute significantly to the overall job satisfaction individually, they do help explain more variance, especially in equation 2.02. For this reason, and that very few interaction variables are worth consideration, the equation 2.02 model was given the greatest weighting in future discussion. The choice to keep values in calculations is supported by Johnson & Holdaway (1994) who recommend the continued measure of importance until the situation is better clarified.

The disagreement in the present research with Poppleton's suggestion to abandon value measurement is probably more practical than theoretical as the discrepancy between studies is highly likely to be associated with the small size of the present sample. Hence, comment on the inclusion of value into job dimension satisfaction measures, beyond a direct application in the present research, cannot be ventured. The lack of variation in the value measurements and the lack of significant effect of value upon overall job satisfaction, advises caution.

All of the models considered, with the exception of the *values only* model, agree that satisfaction with relationships with colleagues is the most influential job characteristic in its association with overall job satisfaction. This scale measures whether teachers perceive themselves to have a good relationship with, and to be receiving adequate support from, their colleagues, with opportunities for professional interaction and advice being readily available. Low measures may indicate a feeling of professional or social isolation and high measures may be a sign of a healthy and supportive school climate. Improved relations between colleagues can be expected to improve overall job satisfaction. Good collegial relations may also contribute to the good human relations described by Rodriguez Fuenzaliada (1996) as reasons given by older teachers in Chile for having remained in the profession.

When teacher collaboration is low and common goals are not present, it is suggested that teacher isolation is heightened. Colleagues are loathe to give or ask for advice from fellow teachers in the fear of being seen as professionally inadequate if they ask for help or socially offensive if they offer it (Rosenholz, 1989). Such feelings of inadequacy are not likely to be conducive to feelings of professional fulfilment and satisfaction and in this light, it is not surprising that satisfaction with the relationships with colleagues has been found to play a strong role in overall job satisfaction.

In the present study, the perceptions teachers have of their relationships with colleagues is slightly above the *"to some extent"* mark (0.7; Appendix 13) which leads to the conclusion that, although teachers are satisfied with their relationships with colleagues, there is room to improve the situation. If relationships with colleagues are essential to overall job satisfaction, then the efforts of the recent reforms in Chile can be viewed with some optimism in their long term effects on teacher overall job satisfaction. The implementation of teacher professional groups (TPGs) is one such development. These groups bring teachers within an institution, together at the institution itself and at regular intervals, to discuss and share pedagogic experiences. An assessment of such groups (Avalos, 1998) showed that teachers found the groups to have helped them get to know colleagues as people and friends, had assisted them to develop the capacity to learn from each other and had made them feel less isolated. A culture of collaboration had been established, whereby the personal needs of teachers and a need to share professional issues with others was satisfied.

The introduction of the ENLACE programme, a computer network linking students and teachers of different schools, will hopefully have similar effects to the TPGs and eventually on teacher overall job satisfaction. This programme is an ongoing component of the recent reforms, one aim of which is to facilitate links between teachers of different institutions enabling them to share experiences (Preston, 1995).

The *rewards only* and *equations 2.02* and *2.03* models put satisfaction with material rewards as the next job characteristic of importance to teacher overall job satisfaction, after relationships with colleagues. Satisfaction with material rewards, as already indicated in the Chilean literature (e.g., Colegio de Profesores, 1997a; 1997b) and in the repeated strike actions, plays an important role in determining overall job satisfaction.

A study of secondary teachers in Santiago, quotes material rewards, specifically salary, as being one of the main reasons that teachers leave the profession. Low salary is also associated with low professional status (Rodriguez Fuenzaliada; 1996). Some may believe teachers not to be motivated by the need for possessions, luxuries or expensive entertainment and that teachers achieve happiness mostly from the appreciation and affection of others (Alburquenque *et al.,* 1987) but this thesis research would show that whilst 'appreciation and affection' as received from working colleagues is indeed highly important to overall job satisfaction, material rewards, although not of the greatest weighting, are still very relevant.

Issues of remuneration are pertinent in other studies of overall job satisfaction outside of Chile (Kniveton, 1991; Black-Branch, 1996), although not in others (Chapman, 1983).

The mean score for the entire material reward scale was 0.6 (Appendix 13), but items referring to salary directly, scored the low means of 0.3 and 0.2 respectively (Table A6.11; Appendix 6). This suggests that, despite efforts of the post-Pinochet governments to improve educational salaries, teachers do not see these changes as adequate. Bearing in mind the importance of this scale to overall job satisfaction, further improvements in salary seem unavoidable if teacher satisfaction is to be attained and further damaging strike action avoided.

Scores on items referring to provision of vacation time, other benefits, job security and sufficient working hours available to teachers show perceptions of these job facets to be better ($\bar{x}$=1.0; 0.4, 0.8; 0.8 respectively)(Table 6.11; Appendix 6) suggesting that clauses within the *Estatuto Docente* (1991) that saught to improve the latter conditions may have had some success in improving teacher satisfaction.

Excluding value from satisfaction measurements would lead to the conclusion that relationships with colleagues and material rewards are the only job facets of significant importance to overall job satisfaction (Table 7.08). If one chooses to keep values as a separate variable, not implicit in the rewards measurement, then further characteristics may also be worthy of consideration in attempts to improve teacher overall job satisfaction in Chile. Physical working conditions and work content are such characteristics (in both equation 2.02 and 2.03, if the significance limits are relaxed to $p<0.1$ for the latter equation).

The physical working conditions scale measured teacher satisfaction with equipment and materials available to them and the conditions of the classroom in which they worked. As this was significantly associated with their overall job satisfaction it would suggest that improvements being implemented through the *MECE Media* programme in this respect are likely to improve teachers' overall feelings of well being.

An average of 0.6 (Appendix 13) was calculated for teachers' perceptions of this job characteristic, which implies that, although physical working conditions are not inadequate, improvement is still necessary. Teachers were least satisfied with the provision of laboratory equipment ($\bar{x}$=0.4; Table 6.13; Appendix 6) and materials in general ($\bar{x}$=0.5; Appendix 6) factors which may be related to class sizes. Teachers in informal discussion often mentioned that there was not enough equipment or space to undertake effective practical lessons with such large groups. A more specific recommendation to improve teacher satisfaction, therefore, would be to improve, not only laboratory infrastructure, but the provision of laboratory equipment and learning materials as well. Parallel provision would need to be made, however, for extra preparation time required in the utilisation of these materials and training in how to use them, otherwise situations described in which materials provision is adequate but under utilised (Pascual Kelly, 1995) will develop.

Career advancement was an influential job characteristic in overall job satisfaction, according to information derived from the use of equation 2.02, second only in contribution to the relationships with colleagues scale. Career advancement scores one of the lowest mean rewards ($\bar{x}$=0.5; Appendix 13) suggesting that teachers do not feel promotions are readily available, fairly handled or that they receive adequate recognition of the job they do. This may be associated with the highly planar nature of the teaching career in the Chilean school system with few managerial positions available and a clear career ladder being absent. As career advancement is seen to have a significant effect on overall job satisfaction of teachers, the development of a clearer career hierarchy would be worth developing.

The consequences of ignoring a deficit in career opportunity is not only important in teachers' overall satisfaction but also in the behaviour they may subsequently express. In a discussion of the relationship between career staging and effort, Lortie (1975)

describes differences between professions that offer a set and clear upward progression (staged) career path as opposed to relatively unstaged professions, such as teaching, where the possibilities for advancement are limited only to a few positions. One function of staging careers, he maintains:

> "is to institutionalise the delay of gratification; stages force younger people to expend effort in the hope of ultimate gain.....Staged careers produce cycles of effort, attainment, and renewed ambition. In tying the individual to the occupation they give him a stake in the future. Staging gives reality and force to the idea of the future; it generates effort, ambition, and identification with the occupation" (Lortie, 1975; p85).

Lortie goes onto to hypothesise that as teachers are in an unstaged career they see little connection between present effort and future benefit. This causes a :

> "... dominance of present versus future orientation among teachers and...a sense of relative deprivation among those who persist in teaching and work at above average levels of effort." (Lortie, 1975; p86).

Although promotion is one means of work recognition, other forms may be helpful in improving overall job satisfaction. Teacher pay incentives based on performance were recommended as part of the reform measures in Chile and may provide the recognition that teachers require (Avalos, 1996a). Financial incentives schemes are widely criticised, however, and are often found not to be beneficial in increasing student achievement, which is most often their aim (Moore Johnson, 1986; Velez *et al.*, 1994). One common complaint revolves around the difference in student circumstances that teachers need to deal with and hence the fair measurement of teacher performance that would reflect teacher effort and not her situation. This is likely to be highly contentious in areas where educational inequalities are still rife.

Incentives need not be financial or based on the individual (Moore Johnson, 1986; Avalos, 1996b) and incentive programmes are at present in place where individual teachers from different regions are publicly recognised for good work. The scope for such recognition is limited, however, to the exceptional few and is unlikely to affect the teaching work force as a whole (Colegio de Profesores, 1997b). Incentives based on

experience may also be of use, encouraging present effort as promise of 'future gratification' and encouraging teachers to remain in the profession.

Unsurprisingly the degree with which teachers are interested and stimulated by the work they perform (work content), would also appear to predict overall feelings of satisfaction. This was one of the highest rated job characteristics ($\bar{x}$=0.9), indicating that teachers are basically enjoying the work of teaching as an occupation.

Management morale is recommended by a consideration of the reward*value alone model but a review of the criticisms of a multiplicative model described earlier (Section 2.10.4; Chapter 2) led to this possibility being ignored.

It is difficult to compare the results found here with other studies of job satisfaction, not only because of differences in sample sizes, but also because of the idiosyncrasy in agendas of interest, scales, levels of education, contexts and methodology from one study to the next. Additionally differentiations need to be made between studies that report on the ratings presented by teachers of job characteristics and satisfaction and those that chose to locate the most accurate predictors of overall job satisfaction.

The amount of research done on job satisfaction in Chile is minimal and, therefore, comparisons can be drawn with only a very few studies. None of the latter went beyond a description of teachers' satisfaction to a description of the influence of characteristics upon overall job satisfaction.

The job facets demonstrated to be relevant in this study were comparable to those found in others within and without the teaching profession. The intrinsic factors of satisfaction with the task itself was of importance in Kalleberg's (1977) research, for example, with workers outside the teaching profession. Of the factors studied in this work, work content was seen as the most important characteristic with the financial dimension taking second place. Poppleton (1989), within the profession, also finds intrinsic factors such as teacher-student relationships and the opportunities and challenges provided by work to be most important followed by conditions of work of which material rewards is one. A general review of all the characteristics that may contribute to a teacher's overall job satisfaction in the present study, shows the intrinsic characteristic of work content to also contribute largely to overall job satisfaction but

that factors extrinsic to the job, i.e., relationships with colleagues and career advancement, have a greater influence. Teachers may enjoy the profession they have chosen but the fulfilment they receive from it is dependent also on factors extrinsic to the profession. An assumption, therefore, that teachers' vocation will be sufficient to keep them satisfied is not a valid one.

The fact that in the Kalleberg and Poppleton studies job facets related to intrinsic characteristics precede extrinsic factors may indicate that these extrinsic factors are to some extent resolved in these countries and professions where the research was conducted. In Chile, the issue of material rewards may have been partially resolved and, therefore, appears lower down in the hierarchy, although it is still of importance. Career advancement and relationships with colleagues are perhaps still in need of address and, therefore, outweigh work content itself.

Maslow's motivational theory (Section 2.10.6; Chapter 2) may also be of explanatory interest here if relationships with colleagues, career advancement and work content scales are equated with the Maslow hierarchy of belongingness and love needs, esteem needs and self actualisation needs respectively. In an adaptation of the explanation provided by Maslow (1954) it may only be when lower level job facets in work are satisfied that higher level satisfaction can be expressed. More in line with the theory, teachers may be motivated to maximise their interest in their work through their own efforts only when more basal work requirements, such as relationships with colleagues and career advancement, have been met (assuming that their own efforts can result in the satisfaction of the required need).

One would expect from this line of reasoning that material rewards and physical working conditions linked with safety needs near the base of the Maslow hierarchy, would supersede work content in order of importance. Maslow states, however, that the order of the hierarchy is not intractable and that some conditions (e.g. reform measures that have partially increased teacher salary) may cause a reversal in this structure. Furthermore, some behaviours may be motivated by more than one need at a time (Maslow, 1954). A desire to increase material rewards for example, may fulfil both safety needs, which may have to a degree been satisfied in Chile, making them less urgent and, therefore, less influential in overall job satisfaction. The need for material

rewards may remain a motivating factor, however, based on a more self-esteem related function associated with teacher status.

Although all the job characteristics recently mentioned should be prioritised in attempts to improve the overall job satisfaction of science teachers in the region of study, the job characteristics that have not proved significant in their independent contributions to overall job satisfaction should not be completely disregarded. The study sample in this study is a small one, and confirmation, using larger more, representative samples, is required. Additionally, although not significant, the inclusion of the remaining characteristics under study better explained the variance in overall job satisfaction and maximisation of such characteristics would be expected to have some positive effect.

Limitations in scale design must be accounted for when considering the lack of significance in certain job characteristics. It was surprising, bearing in mind that students are the main focus of the teaching occupation, that the scales directly relating to students (i.e., student characteristics and responsibility for student progress) did not contribute significantly to teacher's overall job satisfaction. It may be that the items utilised in the case of the responsibility for student progress scale, covered tasks that would only fall in the jurisdiction of teachers directly involved in management positions, responsible for pastoral care (*Orientación*) or pedagogic development (*Unidad Tecnico-Pedagogico-UTP*). Teachers not in such positions may be less likely to participate in these aspects of the job and will either ignore or score low on these reward scales. In their questionnaire teachers were asked to describe the position they held in the school. Although not well done, the descriptions indicated that most teachers appeared to be basic classroom teachers and few had *Orientación* or *UTP* responsibilities (43.1% class teachers; 15.7% with responsibility; 41.2% missing data). The lack of relevance of items to some teachers, therefore, may explain the lack of significance of this scale. A similar argument may be made for the administrative responsibility scale and is confirmed by the lower response rates to these items.

It was surprising that the students' characteristics scale did not influence overall job satisfaction either, bearing in mind the centrality of students to teachers working lives. A moderate correlation between the importance placed upon work content, that *has* been shown to be a relevant characteristic, and value of the student characteristics scale (Table 7.02), may partially account for this. Furthermore, when individual items in the

student characteristics scale (Table A6.08; Appendix 6) were correlated with overall job satisfaction, only items measuring pupil responsiveness in class and student respect for the teacher correlated significantly with overall job satisfaction (0.3*; 0.6**). Level of absenteeism, student attitude towards subject, achievement and level of repetition as perceived by the teacher, were not significantly correlated. This suggests that a scale measuring more the actual relationship between student and teacher, than student characteristics, could prove of greater use. Scales that measured teachers' perceptions and valuations of their teaching practices in the teacher questionnaire may have assisted in this respect (Appendix 4 and 5), but unfortunately were of insufficient reliability to be taken further (Table 5.04; Chapter 5).

In this chapter the contribution of the different job characteristics reward and value scales to overall job satisfaction has been investigated. It would seem that the reward scale is the more important of the two and that values either as independent or interaction type variables could possibly be ignored, the assumption being made that their effect is already incorporated in the reward measurement itself. Their contribution to improved explanation of variance prevents them from being completely dismissed and based on improved explanations of variance and the lesser threat of collinearity, an additive model is preferred.

The job characteristic of greater weighting in the prediction of overall job satisfaction amongst teachers in this sample proved to be that of the relationships with colleagues at school. Other characteristics are also important, such as career advancement, material rewards and physical working conditions. Intrinsic factors such as work content were relevant but there is a need in future research to include, or improve upon, scales that are more involved with the teacher–student relationship.

The analyses in the present and previous chapters have been based on data collected in such a way that teachers have been confined to the topics and responses chosen by the researcher. As there is a certain amount of bias associated with such measurement, teachers were asked to make freer responses on what they felt caused them satisfaction and dissatisfaction in their jobs and this will be now be discussed. Attempts, where possible, will be made to triangulate these analyses with findings produced so far.

CHAPTER 8 SOURCES OF SATISFACTION AND DISSATISFACTION-OPEN ENDED QUESTIONS

In previous chapters an image has emerged of those job characteristics which may be particularly important in giving satisfaction to teachers, and what background characteristics may affect how teachers experience their work. This chapter aims to elicit similar information but through a free response format (as described in Section 5.1.2.1; Chapter 5) by which comparison, contrast and support may be made with information already collected in Likert type scales.

8.1. Analysis

Of the total sample selected for the investigation, 34 teachers provided information on what gave them satisfaction in their professional and work lives and 27 made a response as to what caused dissatisfaction. Data collected from the pre- and within-questionnaire open-ended questions were partitioned into satisfaction and dissatisfaction factors. Categorisation into recurring themes was then achieved through a "cut and paste approach" of the qualitative data. Further analysis according to the type of school administration (municipal or private subsidised), the gender of the teacher, teacher age (above or below 40 years), experience (group 1: 0-11 years; group 2: 12 years and more), the location of the school (La Serena/Coquimbo) and subject taught (Chemistry, Physics and Biology) was completed.

8.2. Response rates

As non-responses to the open-ended questions analysed in this chapter may introduce bias into any conclusion drawn later, responses from the 45 teachers, who returned the teacher questionnaire, but did not mention either sources of satisfaction or dissatisfaction or chose to ignore the question altogether, were reviewed (Table 8.01) before conducting further analysis.

Table 8.01: Non responses to satisfaction and dissatisfaction questions

Grouping		Non response to what causes satisfaction (%)	Non response to what causes dissatisfaction (%)	Non response to questions as a whole (%)
Gender	Male	31	50	25
	Female	21	34	14
Experience	0-11 years	25	38	17
	12 and more years	24	43	19
Age	Below 40	22	39	13
	Above 40	32	42	26
Administration	Municipal	7	33	7
	Private subsidised	33	43	23
Location	La Serena	25	34	16
	Coquimbo	23	54	15
Subject	Physics	33	47	27
	Biology	18	24	0
	Chemistry	56	56	25

In general on all three fronts, men responded less than their women colleagues, which may indicate that male teachers are less disposed or accustomed to expressing their attitudes. This makes an understanding of gender differences in sources of job satisfaction, based on open- ended question data at least, harder to attain.

Such concerns were not evident when related to non-responses rates calculated in a review of teachers by years of experience. Response rates seem unaffected by the experience of the teacher to any great degree with a slight tendency for more experienced teachers not to respond on the dissatisfaction categories. Similar comparison can be made between age groups, older teachers consistently responding less in all three categories although this is not marked. This suggests perhaps that older teachers are more satisfied with their work, being more likely to report areas of satisfaction but not dissatisfaction. Alternatively, they may not wish to add anything to the open-ended categories in addition to the topics already covered in the Likert type questioning.

Private subsidised teachers were less willing to express their attitudes than were municipal teachers which leads to the suggestion that municipal teachers, through their strike efforts, are more politicised or conversant in rhetoric. On the other hand, subsidised teachers may be less inclined to criticise their establishments because of the greater possibility of losing their jobs due to the private nature of the schools ownership and management. This was supported through the observation that several of the private subsidised school teachers showed concern about the destination of the research,

although they were consistently reassured that their questionnaires would be treated with confidentiality.

Bearing in mind the differences in the nature of the teacher, school and student characteristics when viewed in the alternate locations (Sections 6.2.1, 6.4.6, 6.6.5; Chapter 6), extra data that sheds light on the differences between Coquimbo and La Serena needs full consideration. It was worth noting, therefore, the differences in non-responses to the dissatisfaction category between the two locations, the tendency being for teachers in Coquimbo to reply less to this category. This provides an initial indicator that teachers in this region might have less about which to complain, or that they are less willing to do so.

A final analysis of non-response rates was achieved with the aim of detecting bias according to subject area. It would seem that Biology teachers responded better to the question, which may suggest that, of the three subject teachers, Biology teachers are the most articulate of the three. The nature of Biology, being less numerical and more word orientated, may account for this.

Chemistry teachers responded least in all categories. If linked to the fact that they may be working in more than 1 institution, (Tables 6.08 and 6.09; Chapter 6), itself associated with longer working hours (Table 6.13; Chapter 6), this may mean that after rushing between one school and the next, they had little time to respond to the questionnaire as thoroughly as they may have wished.

The bias introduced especially by virtue of the teacher gender, school administration, subject taught and location of the school should be borne in mind when differences in satisfaction and dissatisfaction are discussed later in this chapter.

8.3. Satisfaction

8.3.1. Sources of satisfaction

The responses of teachers concerning factors that caused them satisfaction were categorised into the themes presented and defined in Table 8.02.

Table 8.02: Satisfaction categories

Category		*Definition*
Personal Growth		**Satisfaction that arises through the opportunities teaching provides for personal, spiritual or professional growth/development,** e.g., the opportunity "to develop my abilities, creativity and skills"; the opportunity to " communicate and express myself through the educational field"
Vocation		**Satisfaction with the fact that they are fulfilling a profession for which they have a vocation and/or which they enjoy.** *What teachers individually mean by the term vocation is debatable and it was wondered if in some cases they were simply repeating socially acceptable rhetoric. e.g.,* Satisfaction with the fact that teaching...."allows me to perform a job I enjoy"; Satisfaction that I am "following my vocation"
Working with students	iscellaneous	**Satisfaction derived from items that mentioned students but did not fit in with the other subcategories,** e.g., "Achieving planned targets with the students"; "getting to know (student) realities, interests, defects..."
	Student development	**Satisfaction with the opportunity teaching provides to participate in the intellectual and social development of students, e.g.,** Satisfaction with being "...part of the intellectual, social and personal development of the student"; Satisfaction with contributing to "..... the formation of values within my students"
	Relationship with students	**Satisfaction with the relationships between student and teacher; e.g.,** "...the good relationship I have with my students"; "The affectionate communication that exists with students"
	Student characteristics	**Satisfaction with the behaviour students demonstrate in class, e.g.,** Satisfaction with the ..."participativeness of students"; "the willingness of students to aspire to better expectations in life"
	Student achievement	**Satisfaction derived from the achievements made by students ,e.g.,** "to be able to bring about that students of low achievement and with learning problems, are able 'to learn'; "the achievement of students in higher education"
	Student interest	**Satisfaction gained from the interest students demonstrate for the science subject or the fact that the teacher has managed to stimulate such an interest within them, e.g.,** Teaching "allows (me) to awaken in the student an interest for science"; " the level of interest of students for the subject"
	Working with young people	**Satisfaction derived from working with young people; e.g.,** Satisfaction gained from"...sharing with adolescents"; " I enjoy giving classes to young people".
	Total	Satisfaction with working with students
Being a developer/ former/Educator	Human development	**The satisfaction derived from the opportunity to be involved in the development of people in general e.g.,** "moulding the characters of future men and women"; "the desire to generate positive change in people with whom I have contact"
	Student development	As above. *This sub-category is repeated as it was felt that it contributed both to the category of Working with students as well as the teachers' satisfaction with their role as a developer.*
	Development of society	**Satisfaction with being able to serve and contribute to the development of society as a whole, e.g.,** "being able to work with the disadvantaged sector of society"; "the importance (of teaching) for society"
	Total	Satisfaction with being able to act in the development of individuals and society
Autonomy		**Satisfaction with the level of autonomy that working as a teacher provides ;e.g.,** "The freedom to decide the methodology to be used in the subject"

(Table 8.02 Continued)

Speciality subject		**The satisfaction the teacher derives from the actual science subject content s/he teaches, e.g.,** "That one can apply scientific knowledge to understand daily phenomenon"; "The continual newness of the subject, with respect to its content"
Resources		**Satisfaction with the presence or improvements in the resources available to the teacher, e.g.,** "the increase in didactic resources"; "the adequate availability of support material"
External rewards		**Satisfaction with factors such as salary, holidays or job security**
Timetable		**Satisfaction with the hours or timetable; e.g.,** Being able to work "....30 chronological hours"; "The full working day" *–note that Chile is slowly introducing a full school day system replacing the morning/afternoon and often evening shifts.*
Climate		**Satisfaction with the general atmosphere or climate of the school. e.g.,** "the work atmosphere is pleasant"
Infrastructure		**Satisfaction with the presence or improvement in school infrastructure, e.g.,** "implementation of laboratories"; "adequate computer rooms"
Human relations	General	**Satisfaction with relationships within the school without specification, e.g.,** "good interpersonal relationships"
	Relationship with colleagues	**Satisfaction derived from relationships held with colleagues.** *(The majority of teachers did not draw a distinction between teaching or non-teaching colleagues-only two teachers specified that the colleagues they referred to were the teaching staff).*, ***e.g.*** "the affection of my colleagues"; "interaction with other professionals"
	Relationship with students	**Satisfaction with the relationships between student and teacher.** *(as above, this sub-category is repeated as it was felt that it contributed both to the category of working with students as well as the teachers satisfaction with their interpersonal relationships in school)*
	Relationship with parents	**Satisfaction with relationships held with parents, e.g.,** "The constant communication with parents and guardians"
	Relationship with management	**Satisfaction with their relationship with school management, e.g.,** The support of teachers by management"; "The support of the methods-pedagogy department"
	Total	Satisfaction with interpersonal relationships with actors within the educational establishment
Recognition and respect		**Satisfaction derived from the recognition of their work , e.g.,** "The respect for teachers by pupils and parents"; "recognition as a good teacher by my peers"
Training		**Satisfaction with pre or in-service training. , e.g.,** "...good quality in-service training"
School characteristics, ethos or educational programme		**Satisfaction with the educational programme or characteristics of the school. , e.g.,** "The planned objectives of this establishment are related and in agreement with my vision of education"; "to see the school is progressing technologically as it should be"
Miscellaneous		**Satisfaction with items not readily classified into any of the above groupings. e.g.,** "The location (of the school) is in a city that I like"; "the option to advance in the career"

One hundred and eighty eight items were mentioned by the 34 responding teachers and the percentage of this total, as covered by each category, can be viewed in Table 8.03 and Figure 8.01. The percentage of the teacher sample mentioning the different categories can also be seen in the latter table.

Table 8.03: Distribution of satisfaction responses based on total item response and the percentage of teachers mentioning category

	Grouping	*Incidence of items per category (% of 188)*	*Total teacher sample reporting in each category (% of 34)*
Category			
Personal growth		6	26
Vocation		5	21
Working with students	Miscellaneous	2	9
	Student development	4	21
	Relationship with students	2	9
	Student characteristics	5	29
	Student achievement	3	18
	Student interest	4	15
	Working with young people	4	24
	Total	24	74*
Role as a developer/former/educator	Human development	7	24
	Student development	4	21
	Development of society	4	21
	Total	15	47*
Autonomy		3	18
Speciality subject		3	12
Resources		2	12
External rewards		2	12
Timetable		2	9
Climate		2	12
Infrastructure		4	9
Human relations	General	3	15
	Relationship with colleagues	6	32
	Relationship with students	2	9
	Relationship with parents and guardians	2	9
	Relationship with management	5	24
	Total	18	53*
Recognition and respect		5	17
Training		1	6
School characteristics, ethos or educational programme		4	17
Miscellaneous		6	29

*Some teachers made a comment in both sub categories but were counted as only a single unit in the full category. For this reason the total percentage for the full category does not always tally with the sum of the sub categories in this and other tables of this chapter.

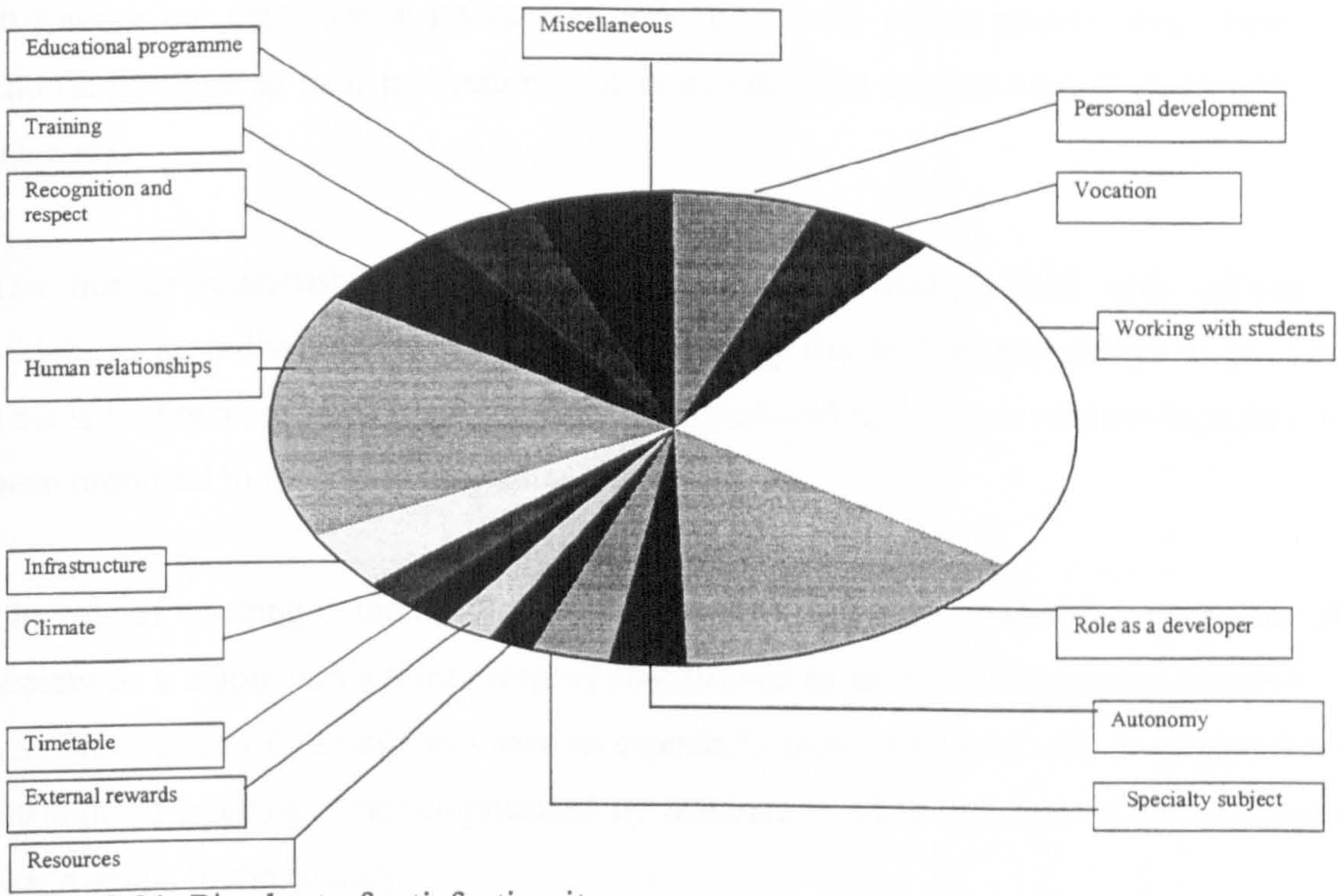


Figure 8.01: Pie chart of satisfaction items

The most frequently mentioned source of satisfaction was related to working with students. This confirms the findings of other authors such as Nias (1981) and Lortie (1975) that maintain that teachers derive most satisfaction from such interaction. Chilean teachers share this trait with teachers elsewhere, therefore, denoting that a universal source of pleasure within the teaching profession as a career is associated with working with young people, the relationships that are formed with them as a result, the positive characteristics students display within the classroom and the opportunity teaching gives them to contribute to the development of these young lives.

The importance of this category in satisfaction supports the recommendation made in Chapter 7 that scales relating to teacher-student relationships must be included or those available improved upon in future instrument design.

The next most common source of satisfaction was associated with the relationships teachers formed within the profession. This demonstrates that teachers in Chile are sociable people (in the particular region and subject area studied at least) and that the relationships they form with other individuals whether it be with their students, their colleagues, parents or with management, are important to them. This result is particularly interesting when one considers the low social interest traditionally (although

perhaps wrongly) associated with scientists. Individuals who have a liking and ability in science but enjoy social interaction, especially with young people, may, therefore, choose teaching as their profession as it is an effective combination of these needs or interests.

The human relationships category incorporates relationships held with colleagues, which, as an individual category, is mentioned by the highest percentage of teachers. This is in direct confirmation of the importance placed upon these relationships that had been proposed in the previous chapter.

The role of teaching in the development of people in general, students in particular and society as a whole was a third category that proved to be a main source of satisfaction. The importance of this role was seen as especially interesting as it was wondered if this attribute of teaching is not emphasised by teachers in Chile because of the developing world status of the country.

The enjoyment of teaching the subject itself received little mention by this group of science teachers which leads to speculation as into which of two divisions their professional identities fall, i.e. distinctions between viewing themselves primarily as either pedagogues or scientists.

8.3.2. Distributions of sources of satisfaction by individual teacher characteristics

8.3.2.1. Teacher gender and age

The responses of teachers as to what factors caused them satisfaction can be grouped according to the teacher's gender and age (Table 8.04). So fairer comparisons between unequal groups could be made, each percentage was calculated using as a total the maximum number of teachers for each subgroup that had made a response to the satisfaction component of the question. Such comparison was achieved, and the significance of differences tested, through cross tabulations and Chi squared statistics. In this and other grouping analyses only results of interest will be reported. A full display of results is available in Appendix 14.

Table 8.04: Distribution of satisfaction responses based on teacher gender and age

	Grouping	*Gender*			*Age*		
Category		*Female (% of 23)*	*Male (% of 11)*	*♣χ^2 statistic (d.f.=1)*	*Below 40 (% of 18)*	*above 40 (% of 13)*	*♣χ^2 statistic (d.f.=1)*
Working with students	Miscellaneous	4	18	1.8	6	15	0.8
	Student development	17	27	0.4	17	31	0.9
	Relationship with students	13	0	1.6	17	0	2.4
	Student characteristics	43	0	6.8*	17	46	3.2
	Student achievement	17	18	0.0	22	15	0.2
	Student interest	13	18	0.2	11	23	0.8
	Working with young people	35	0	5.0*	22	15	0.3
	Total	83	55	3.0	67	85	1.3
Role as a developer/former/ educator	Human development	26	18	0.3	11	38	3.2
	Student development	17	27	0.4	17	31	0.9
	Development of society	17	18	0.0	17	23	0.2
	Total	43	55	0.4	33	69	3.9
Speciality subject		13	9	0.1	6	23	2.1
External rewards		17	0	2.2	11	15	0.1
Timetable		9	9	0.0	0	15	3.0
Climate		17	0	2.2	11	15	0.1
Recognition and respect		13	27	1.0	28	8	2.0

♣As the cross tabulations, of which the χ^2 statistic is presented here, were 2X2 in nature and cell size was small, acceptance of the significance of cell membership was based on the Fisher's χ^2 calculation where appropriate rather than the Pearson's χ^2 value.

In the gender distribution, a significant association between gender and sources of satisfaction involving working with young people and the student characteristics categories were calculated. Differences by gender in the working with students as a total scale, climate and external rewards, although not significant at the 5% level, are worthy also of consideration. In all cases it was the female teacher who was more likely to make commentary on these categories.

Although in many of the categories both genders showed similarities in what they felt gave them satisfaction (see Table 14.01; Appendix 14), there was room, based on the above differences, for speculation on whether male and female teachers gain satisfaction from different components of the profession. Female teachers enjoy the interaction and stimulation from working with young people and the positive characteristics of the students they teach, factors that seemed of significantly less importance to male

teachers. Therefore, when it is concluded in other research (e.g., Nias, 1981) that teachers receive most satisfaction from working with their students, this may in fact reflect the female bias that often exists in teacher samples drawn for analysis. Possible differences in the manner in which male and female teachers experience their profession has been alluded to previously (Section 6.6.2; Chapter 6).

The gender disparity described may arise from what female and male teachers perceive to be socially more acceptable; a social norm that dictates to them what their sources of satisfaction should be. This is supported, if direct questioning, (as used in the methods employed in this thesis) is accepted as evoking ideological responses (Lortie, 1975). Making a report in line with a gender related social norm, could be described as such a response.

Female teachers also derived satisfaction from the climate of the school and the external rewards that the profession provided them. None of their male colleagues mention the latter category. If it is accepted that in a more traditional society such as Chile, the male teacher is likely to be the main breadwinner of his family, it is not surprising that the material rewards such as salary, especially low in teaching, are unlikely to grant him any particular satisfaction. In fact the reverse is anticipated. If they do mention material rewards, female teachers may see their contribution to the family income as less pressing and, therefore, are better satisfied with it. Additionally, other external rewards such as holiday time may be a source of satisfaction for mothers with children.

Although no category showed a strong majority response by male teachers, if one considers the categories in which a 10% or more deficit between male and female teachers exist in favour of the male teacher, it would seem that male teachers gain their satisfaction more from their contribution to the development of the student and their role as a developer in general. Furthermore, male teachers derive satisfaction from the respect and recognition the position affords them. Again such reports may be influenced by societal norms where respect and recognition, for example, are perhaps held to be more important for male employees. Furthermore, if male teachers gain satisfaction from job facets such as salary or status, then it is unsurprising that their non-response rates on the satisfaction category (Table 8.01) are high. As these factors are low in Chile, they have little about which to write.

A general conclusion is, therefore, that male and female teachers derive satisfaction from different attributes of the same job but it must be remembered that such a statement is diluted by the possibility that their reports on satisfaction may be partially determined by what society has dictated to them. Comments made by studies in the United Kingdom are interesting in this regard, however, where no:

> "...support for such stereotypes as 'women find emotional satisfaction in working with children' and 'men enjoy organisation'..."(Nias, 1989; p4)

was found. Indeed,:

> "...men become just as attached to their pupils as women do, and women are as interested in organising and influencing their colleagues as men are; in short, ... simplistic sexist notions do not stand up to examination." (Nias, 1989; p4).

There is, and perhaps unfortunately, evidence that these 'sexist notions *are* standing up' in Chile and may reflect a more traditional school or even national culture. Nias, however, situates her study within the primary sector, one less attractive to the traditional man. This may explain her choice to ignore gender bias in her work and the disagreement with the present findings in secondary education.

No significant associations were found between mention of a particular category and the age of the teacher. Again, based on the size of the χ^2 statistic, it was seen fit to draw attention to differences in the role of a developer as a whole, human development specifically, student characteristics, the timetable, the relationship with students and the speciality subject categories. In all but the relationship with students, older teachers were more likely to mention these categories as sources of satisfaction. In the latter scale, however, it was more probable that younger teachers would respond in this fashion.

It is often reported that younger teachers are preferred by students and are seen as more enthusiastic (e.g., Errázuriz *et al.*, 1994), a feature explainable by the fact that younger teachers may find some novelty in working with students. The enjoyment this brings is, therefore, a source of satisfaction. As teachers progress in their careers, this novelty fades and, as each year passes, relationships formed with students are no longer

something new and central to the job. Moreover, as the teacher gets older, the broadening age gap between themselves and students reduces the possibility and/or the wish to form closer relationships with them that a younger teacher may have desired. Relationships with students continue to be seen as important by older teachers but are a reduced source of active satisfaction. Other components in the teacher's working life such as enjoyment of their speciality subject may surface as interest in the student wanes. Holding down a position, where they are able to work the desired number of hours they require, in as convenient a manner as possible, may begin to take precedence as changes occur in commitment in their home lives. This has been reflected in the timetable satisfaction category. Reform measures may not always be in tune with these needs of older teachers, however, as is shown in the changes to the shift system now occurring. Chile is at present in the process of changing from a shift system to a full school day, in anticipation that increasing the instruction time to students will improve student achievement as well as protect teachers from the work overload, inconvenience and discontinuity that working multiple shifts may have caused. There has been some criticism of this, however, (Prea, 1998) from teachers that had taken advantage of the shift system in various forms, to organise child-care, for example. Time tabling was indeed quoted as a source of dissatisfaction later on in analysis (Section 8.4) but only by two of the responding teachers. The influence of the change in shift system, and its effects upon students and teachers, is a theme that needs be further explored.

Older teachers no longer appear to gain satisfaction from the relationship with the student but from the less personal "characteristic of the child" being taught. They seem more conscious of their 'role as a developer' than are younger teachers as they may have had the opportunity to see their influence on students in the longer term (in students coming back to visit schools after going to university for example). Future longitudinal studies might explore all these possibilities.

8.3.2.2.School administration and teacher experience

Similar distributions by school administration and years of experience are presented in Table 8.05.

Table 8.05: Distribution of satisfaction responses based on school administration and years of experience.

	Grouping	*School administration*			*Experience*		
Category		*Municipal school (% of 14)*	*Private subsidised school (% of 20)*	*χ^2 statistic (d.f.=1)*	*0-11 years (% of 18)*	*12 and more (% of 16)*	*χ^2 statistic (d.f.=1)*
Personal growth		36	20	1.1	39	13	3.0
Working with students	Miscellaneous	14	5	0.9	6	13	0.5
	Student development	29	15	0.9	17	25	0.4
	Relationship with students	7	10	0.1	17	0	2.9
	Student characteristics	29	30	0.0	22	38	1.0
	Student achievement	7	25	1.8	22	13	0.6
	Student interest	14	15	0.0	11	19	0.4
	Working with young people	29	20	0.3	28	19	0.4
	Total	71	75	0.1	78	69	0.4
Being a developer/former/ Educator	Human development	43	10	4.9*	22	25	0.1
	Student development	29	15	0.9	17	25	0.4
	Development of society	14	20	0.2	11	25	1.1
	Total	64	35	2.8	39	56	1.0
Timetable		14	20	0.9	0	19	3.7
Infrastructure		21	0	4.7	6	13	0.5
Training		14	0	3.0	11	0	1.9

Municipal teachers appeared to report sources of satisfaction related to participation in human development significantly more that their private subsidised school colleagues. This was the only significant association, although the infrastructure scale only just missed the required level of probability. Municipal teachers were again more likely to report on this category.

The greater probability of municipal teachers mentioning the satisfaction they gain from their role as a developer may indicate that municipal teachers value more highly the altruistic side of the job than their private subsidised peers. Such teachers may have chosen to work in an environment that attracts students of lower socio-economic status in agreement with such a value system or in fact have developed such values latterly as

they begin to work with students of disadvantaged backgrounds that stimulate altruism within them.

Municipal establishments are more likely to suffer from deficiencies in infrastructure as dictated by lack of private subsidy and the toll these schools underwent during the dictatorship. The tendency for municipal teachers to report infrastructure as a source of satisfaction was, therefore, surprising. It may be linked, however, with the visible and recent changes to infrastructure implemented through the MECE Media programmes in these schools, the latter alterations to the schools making this aspect of the job more salient to municipal teachers. If these evident changes were compared by teachers to prior deficient states, it is probable that the *improvements* in infrastructure have caused them satisfaction.

As in the analysis of age, no significant relationships were observed between the satisfaction categories and the experience of the teacher. Potential lay, however, in the observation of the personal growth and relationships with students categories that appeared to be favoured by the less experienced teacher as a source of satisfaction, and the timetable category preferred by more experienced teachers.

The greater instance of reports of satisfaction derived from relationships with students by less experienced teacher, and of the timetable category by more experienced teachers, may be explained in a manner similar to that presented for the age variable. Personal growth was reported more frequently by the less experienced teacher and may reflect the steep learning curve teachers undergo at the beginning of their career and the stimulation they derive from this.

8.3.2.3.Subject taught

The distributions of categories by the subject taught are presented in Table 8.06.

Table 8.06: Distribution of satisfaction responses based on subject taught.

	Grouping	**Subject taught*			
Category		*Physics (% of 10)*	*Biology (% of 13)*	*Chemistry (% of 11)*	*χ^2 statistic (d.f.=2)*
Being a developer/ former/ educator	Human development	0	23	45	6.0*
	Student development	20	23	18	0.1
	Development of society	10	15	27	1.2
	Total	30	54	55	1.7
External rewards		0	8	27	4.1
Human relations	General	0	31	9	4.7
	Relationship with colleagues	20	46	27	2.0
	Relationship with students	0	15	9	1.7
	Relationship with parents and guardians	0	23	0	5.3
	Relationship with management	10	38	18	2.8
	Total	30	77	45	5.4

*Teachers who taught two or more different subjects were excluded from the analysis.

Analysis was conducted of the categories by the subject the teacher taught, using the χ^2 statistic. As these cross tabulations were not 2X2 in nature, however, the low cell counts cannot be guarded against with the Fisher statistic. These results, therefore, need to be regarded as very much preliminary in nature and as providing suggestions only as to where future research may be fruitful.

Some of the trends in subject responses (Table 8.06) support the decision to treat the three science disciplines as separate (Section 5.2; Chapter 5) and acknowledge the possible existence of subcultures within the science teaching culture as a whole. Treatment of the teacher sample as three separate subject groups, rather than as an amalgamated set referred to as science teachers, therefore, continues to be recommended. Without a greater knowledge of what the culture of each individual teaching subject might be, however, reasons for variation between subjects are difficult to define. Possible explanations may lie in the personality types, interests or values of individuals attracted to each particular subject.

One tendency observed was for Biology teachers to report more frequently on their satisfaction with their relationships with parents, human relations in general and human relations as a whole. Physics teachers reported consistently the least in these categories. Biology might be described as the more socially orientated of the sciences and the importance placed upon relationships by these teachers may be an indication that they are persons likely to derive satisfaction from socially orientated themes both within their subject content and their work environment. Physics teachers appear the least social. The fact that the majority of Biology teachers are female and Physics teachers male may indicate that an interaction with gender may be occurring here.

A greater percentage of Biology teachers in general (Table A14.07; Appendix 14) appeared to report more sources of satisfaction with differing categories than other subject teachers. This, in conjunction with the fact that they are responding better to the satisfaction question as a whole to begin with (Table 8.01), suggests that Biology teachers may have a more positive experience of teaching. Alternatively, differences observed may be giving a false impression of disparity, when true reasons for disparity of subject teacher responses is attributable, as expressed previously, to the predisposition of Biology teachers to being more articulate in their replies.

Chemistry teachers appear to find more satisfaction in human development in general than other teachers. This was the strongest of the tendencies calculated in Table 8.06, reaching significance at the 5% level. Little congruence between this finding and what was already known about Chemistry teachers so far in analysis could be found. Chemistry teachers, for example, tend to work in more than one institution but 2 of the 5 Chemistry teachers who responded on the importance of human development, worked in one institution. The other 3 worked in 2. This did not, therefore, help in explanation. More about the value systems of this particular subject area would need to be investigated before this trend could be further understood.

Chemistry teachers also tended to mention external rewards as a source of satisfaction but as all teachers making this response were female it was felt that an interaction with gender might again be occurring and explanation pertaining to the tendency of female teachers to report satisfaction is pertinent here too.

8.3.2.4.Location of school

A final division of satisfaction categories can be made based on the location of the school in which the teacher is employed (Table 8.07).

Table 8.07: Distribution of satisfaction responses based on school location.

	Grouping	***Location of school***		
Category		***La Serena (% of 24)***	***Coquimbo (% of10)***	***χ^2 statistic (d.f.=1)***
Working with students	Miscellaneous	8	10	0.0
	Student development	21	20	0.0
	Relationship with students	8	10	0.0
	Student characteristics	29	30	0.0
	Student achievement	21	10	0.6
	Student interest	8	30	2.6
	Working with young people	21	30	0.3
	Total	75	70	0.1
Human relations	General	17	10	0.3
	Relationship with colleagues	33	30	0.0
	Relationship with students	8	10	0.0
	Relationship with parents and guardians	4	20	2.2
	Relationship with management	21	30	0.3
	Total	58	40	1.0

This analysis did not provide much further insight into differences between the regions as no significant results were calculated and comment is restricted to two trends only. The first is the interest of students in the subject, teachers in Coquimbo mentioning this more frequently. Student attitudes to Chemistry and Biology classes, the Biology teacher and their perceptions of the satisfaction of the Biology and Chemistry teachers, were shown to be better in Coquimbo (Section 6.2.1, Chapter 6). Additionally, if the subjects taught by those teachers who made comments on student interest were reviewed, they were indeed found to be Biology and Chemistry teachers. This suggests the better attitude of students in Coquimbo is an explanation of why a greater percentage of teachers in this region quote this job facet as a source of satisfaction. Sample numbers are far too small to make any form of general conclusion about this, however, other than to recommend that the theme is explored further with larger sample

numbers if reasons for this particular difference between La Serena and Coquimbo is to be understood.

There also appeared to be an indication that teachers in Coquimbo were deriving satisfaction from their interaction with parents. The port of Coquimbo, and the areas of Tongoy and Tierra Blanca that form part of this region, are smaller communities than La Serena and perhaps tighter knit as a result. This may facilitate parent-teacher interaction. This is in contrast to suggestions made earlier (Section 6.6.5; Chapter 6) where the poorer nature of Coquimbo was blamed for lesser reports on community school relations in this region. This failure of Likert and open-ended questions to triangulate, suggest that differences in location are far from explained.

8.4. Dissatisfaction

8.4.1. Sources of dissatisfaction

The responses of teachers concerning factors that caused them dissatisfaction were categorised into the themes presented and defined in Table 8.08. It can be observed firstly that a lesser variety and quantity of items were forth coming than was the case in the satisfaction categories. This was in contradiction to the findings of Nias (1981) that the variety and number of factors causing dissatisfaction in teachers outweighed those causing satisfaction. This discrepancy may reflect the differences in conditions and/or cultures between Chile and England. It could be argued that Chileans may be more positive in their outlook or alternatively react as a people recovering from the restrictions of a dictatorship, in which criticism of the establishment would not have been encouraged.

Table 8.08: Dissatisfaction categories

Category		*Definition*
Salary		**Dissatisfaction with salary, e.g.,** "Low pay received in relation to academic level"; "Receiving a wage that is not in agreement with a university profession."
Training	Initial training	**Dissatisfaction with initial training, e.g.,** "Not having access to modern scientific knowledge in training"
	In-service training	**Dissatisfaction with in-service training, e.g.,** "lack of opportunities for in-service training in specific subject area"; "high cost of in-service training."
Total		**Dissatisfaction with initial and in-service training**
Status		**Dissatisfaction with low status of teaching in society, e.g.,** "Little recognition by other professionals"; "Not recognised by society like before...."
Student characteristics	Student background	**Dissatisfaction with socio-economic background of student, e.g.,** "The socio-cultural level of the students contributes to my dissatisfaction with my work."
	Student characteristics in school	**Dissatisfaction with motivation in students and poor behaviour, e.g.,** "Low motivation and disposition on the part of students"; "Discipline problems and little control by the authorities".
Total		**Dissatisfaction originating from contact with students**
Quantity of Work	Workload	**Dissatisfaction with the amount of work, often related to the long working hours, e.g.,** "Due to the low salary received in this school, I have to work in another private school that keeps me busy between 15.00 and 22.00 hours; this means I have an excessive number of working hours."; "Quantity of work I have to take home."
	Lack of time	**Dissatisfaction with time available to comply with teaching tasks, e.g.,** "Reduced time to prepare materials"; "I do not have time for my work during the day."
Total		**Dissatisfaction related to lack of time, excessive working hours and workload.**
Pupil Number		**Dissatisfaction with quantity of students in classroom.** *In many schools (private subsidised and municipal) class sizes of above 40 were the norm*, **e.g.,** "Massive classes. It is not very stimulating for our work because learning is not at an optimum"; "High number classes make it impossible to control practical work."
Parental support		**Dissatisfaction with parental support for the student or educational process, e.g.,** "Low commitment of parents in the (educational) process."
Resources		**Dissatisfaction with resources, e.g.,** "Lack of material resources for the number of students"; "Lack of laboratory materials for group work"
Relationships with colleagues		**Dissatisfaction with interpersonal relations with working colleagues, e.g.,** "Lack of transparency and loyalty in some of my peers"; "....undermining (of the teacher) by some members of the educational community in front of students and parents."
Computers		**Dissatisfaction with use of computers in the curriculum or the time to use them, e.g.,** "little preparation and presence of computation in the subject curriculum"; "The time available to utilise computation more."

Table 8.08 (Continued)

Timetable	**Dissatisfaction with their working timetable, e.g.,** Dissatisfaction with…."The 30 hour timetable distributed between the morning and the afternoon. I think this should be condensed."; "The full school day." *(as opposed to the shift system)*
Hours allocated to speciality subject	**Dissatisfaction with number of hours dedicated to their speciality subject in the week., e.g.,** "The quantity of hours assigned to the subject of Chemistry is insufficient to complete the entire programme."
Infrastructure	**Dissatisfaction with infrastructure, e.g.,** "The lack of a laboratory capable of holding 45 children at the same time"; "The lack of appropriate space in which to develop activities."
Miscellaneous	**Dissatisfaction with items difficult to slot into the categories developed, e.g.,** "The lack of a clear and established educational project (plan) in my school"; "The slowness of change"(*referring to the on-going educational reforms).*

One hundred and eighteen items on dissatisfaction were mentioned by the 27 responding teachers and the percentage of total items, as covered by each category, can be viewed in Table 8.09 and Figure 8.02. The percentage of the teacher sample mentioning each category can also be seen in this latter table.

Table 8.09: Distribution of dissatisfaction responses based on total item response and percentage of teachers mentioning category

	Grouping	Incidence of items per category (% of 118)	Total teacher sample reporting in each category (% of 27)
Category			
Salary		15	56
Training	Initial training	3	7
	In-service training	5	19
Total		8	26
Status		6	22
Student characteristics	Student background	2	7
	Student characteristics in school	8	30
Total		10	33
Quantity of Work	Workload	7	30
	Lack of time	3	11
Total		10	37
Pupil Number		8	26
Parental support		3	11
Resources		9	37
Relationships with colleagues		4	11
Computers		2	7
Timetable		2	7
Hours allocated to speciality subject		7	26
Infrastructure		8	33
Miscellaneous		11	37

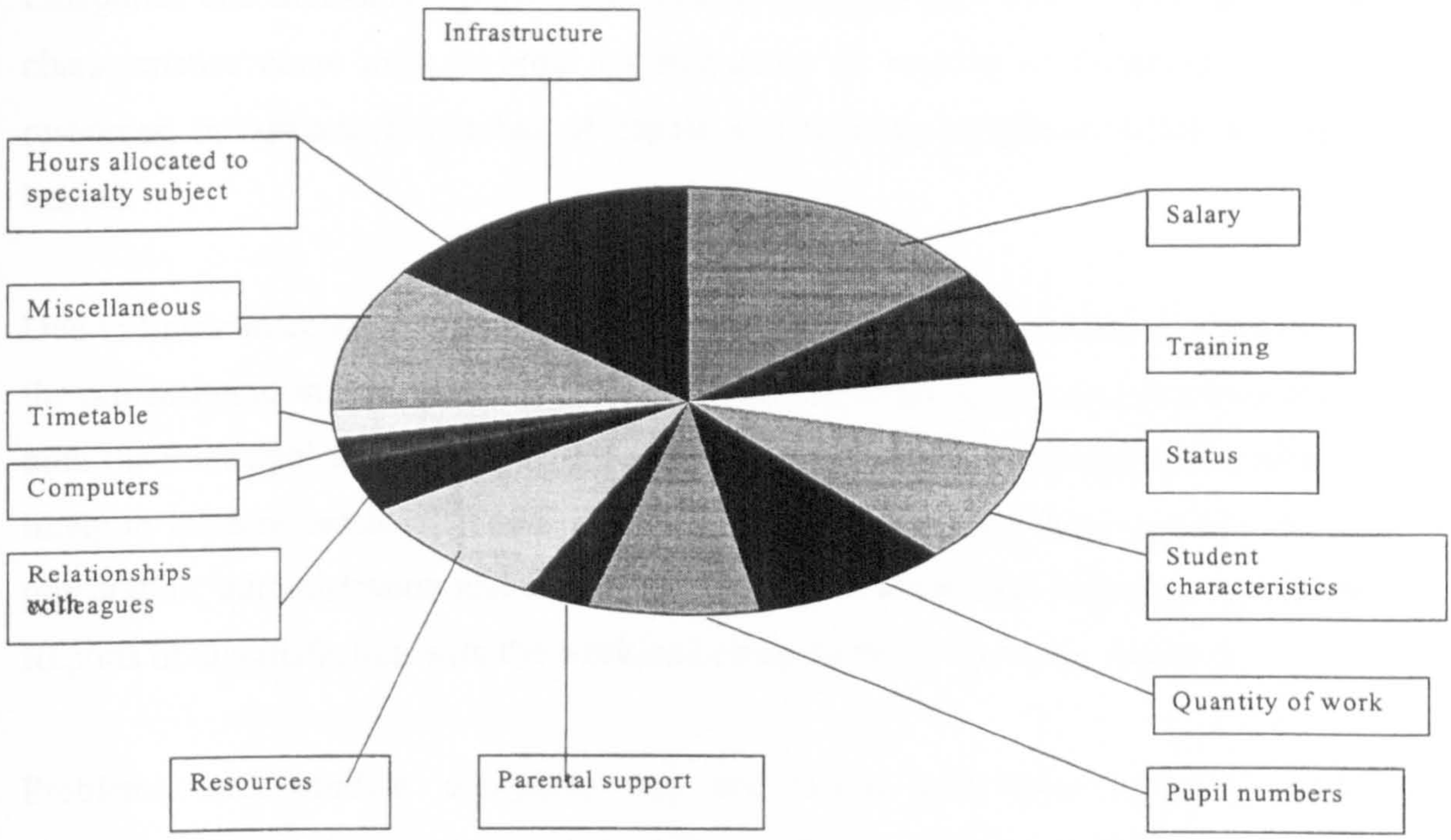


Figure 8.02: Pie chart of dissatisfaction items

Considering the descriptions of the state of the teaching profession made previously (Sections 3.7 and 3.8, Chapter 3), the themes that arose as sources of dissatisfaction were not unexpected and this analysis provides an empirical confirmation of some of these reports (e.g., Aravena Bolivar, 1994; Colegio de Profesores de Chile, 1997a; 1997b).

Dissatisfaction with the teaching salary was the chief source of dissatisfaction, most often mentioned and by the highest percentage of responding teachers (over half of the sample). This was to be expected as previous discussion of the literature (Section 3.8; Chapter 3) and the quantitative findings of this thesis (Section 7.3.6; Chapter 7) make clear. Several teachers in the sample qualified this dissatisfaction by highlighting the contradiction between the years of university education required to undertake the profession and the eventual salary. Poor teacher status was also mentioned in the literature as a relevant issue, influenced adversely by the dictatorship period. Dissatisfaction expressed by 22% of the responding teachers shows this has not been eradicated.

Categories encompassing reports of excessive workload and lack of time and student characteristics come next in order of frequency as sources of dissatisfaction, with resources, infrastructure, number of pupils and training categories following closely behind.

Due to financial constraints, many teachers work in several institutions or even outside the profession to make ends meet. This, in addition to the large pupil numbers seen in both the municipal and private subsidised sectors (a source of dissatisfaction itself), is likely to increase teachers' workload by putting pressure upon them in terms of class preparation, administration and marking, factors also associated with time constraints. Reports of dissatisfaction with the workload component is, therefore, expected.

Problems with student discipline and motivation and other negative student characteristics are frequently mentioned by teachers. This is in line with issues of student motivation described elsewhere in Chile (Gysling, 1992b).

Although some teachers receive satisfaction from the developments evident in their school (Section 8.3.1), continued dissatisfaction with resources and infrastructure is disappointing in light of the efforts of the MECE programme to improve these. It is possible that the effects of the new resources and infrastructure, visually evident in several of these schools, have not as yet been in place for sufficient time for their presence to be fully appreciated or utilised by some teachers. Furthermore, if additional resources fail to be accompanied by sufficient training in material use or have not met the actual needs of the teacher then teachers may remain unhappy. This may well be the case if comments on adequate resourcing but pedagogic mismanagement in schools in Santiago is remembered (Pascual Kelly, 1995). The increase in resourcing and infrastructure may alternatively have sensitised teachers to the issues of continued shortages and shortfalls.

It has been suggested that attitudes can be changed if the aspirations of the person (in this thesis, the teacher) are raised (Katz, 1960). This may have been the case in Chile in the post Pinochet era where the reversion to democracy, and specifically the new educational reform measures, may have encouraged teachers to nurture new aspirations for improved salary, status and working conditions. Failure of reforms to fulfil these new aspirations in teachers may have led to the development of poorer attitudes to

certain conditions that reforms have approached and may further explain the continued dissatisfaction specifically with resources and infrastructure reported here. Policy would gain little advantage from trying to lower teacher aspirations but it might be suggested that care be taken when spinning the benefits of a new regime and reforms.

Previous reports of initial training that does not provide sufficient preparation and in-service training, that is inferior in quality and low in occurrence, confirm the findings presented in Table 8.09 and Figure 8.02 (Pascual & Navarro, 1992; Errázuriz et al., 1994; Insausti Tuñón & Oñorbe de Torre, 1997). Duke (1984) presents an outline of the expectations which new teachers may hold upon entering the profession and the nature of reality that might cause them disappointment. This ranges from the expectations concerning the characteristics of their students, the nature of the teaching tasks and professional activities to expectations related to public support and the adequacy of training. Teachers may expect their students to be motivated and become frustrated when faced with apathetic or poorly disciplined classes, for example. Similarly some new teachers might expect high levels of collegiality within the school and become frustrated when the reality of teacher isolation and even competition between teachers becomes evident in reality. Dissatisfaction of some Chilean teachers with initial training points to the need for teacher training reforms that prepare teachers for the reality they are likely to face and the avoidance of the potential for disillusionment and associated dissatisfaction this might create.

In-service training has also been found wanting in this sample of Chilean teachers, perhaps as this activity may be particularly out of the average teacher's reach as she is often expected to attend courses and conferences in her own time and at her own expense.

In previous studies teachers have been reported to be dissatisfied with their lack of authority and decision-making power seen as having being partially removed from them during the Pinochet regime (Rodriguez Fuenzaliada, 1996). This complaint was not evident in the present teaching sample. In fact pedagogic autonomy had been quoted by a few teachers as a source of satisfaction (Section 8.3.1). The disagreement may reflect a difference between metropolitan teachers (on whom the Rodriguez Fuenzaliada study focused) and the present regional teacher sample. Furthermore, the present sample

consisted of science teachers alone, and they might arguably be less interested in issues of decision making and involvement in governance than, say, humanity teachers.

It was also surprising that job security was not mentioned as a source of dissatisfaction as in other reports (Lopez *et al.*, 1984). Protection through policy such as the *Estatuto Docente* (Ministerio de Educación, 1991) has been implemented and would appear to have been successful to a degree, judging from the lack of report on dissatisfaction with job security in this sample.

Ulterior motives as to why teachers may respond in particular ways must be considered. A teacher in reality may not find resources a particular source of dissatisfaction, as he would not normally incorporate them into his teaching because of the extra preparation involved. The rhetoric in education, however, is that resources are important and, therefore, the teacher makes mention of this.

8.4.2. Distributions of sources of dissatisfaction by individual teacher characteristics

As with the sources of satisfaction, dissatisfaction categories were partitioned between the various groupings of teachers. It would seem, from these divisions, that different teachers working in different institutions have more in common in their sources of dissatisfaction than in their sources of satisfaction. This was shown by the lower number of notable differences shown between groupings (Appendix 14 for a full display of results - very few proved to be significant at a 5% level or even approach this). It suggests that there are common areas within the teaching profession that cause teachers displeasure, e.g., infrastructure, salary, resources. What cause them satisfaction, however, may be largely due to the teacher as an individual. It may be proposed, therefore, that any future reform measures address the dissatisfactions of the teaching work force rather than trying to maximise satisfaction as the former are more likely to be shared by many and the latter be the function of the individual and the circumstances in which he finds himself.

Furthermore, if Herzberg *et al.* (1959) are correct in believing that once job satisfaction has been stimulated, it persists for a longer period than does dissatisfaction, which is shorter lived, it may follow that dissatisfaction is the weaker attitude and easier to

reverse. This would again support interference in factors that cause dissatisfaction rather than the reverse.

The recommendation to address dissatisfactions may be valid if teacher feelings of well being are the only educational goal. Landy (1989), however, also picks up on the duration of work attitudes and applies it to worker performance, suggesting that job dissatisfaction may have less effect on performance simply because it is less enduring. Bearing in mind that a theme addressed in this thesis is the relationship between teacher satisfaction and students' outcomes (a measure of teacher performance), it may be argued that areas of job *satisfaction* rather than dissatisfaction need to be the focus of educational change. Future research needs to concentrate on the duration of teacher attitudes, both positive and negative, to resolve these opposing arguments before any firm educational policy can be made. The duration and strength of job satisfaction may also explain why a greater variety of satisfaction rather than dissatisfaction sources are reported by teachers.

The few significant and notable differences between sources of dissatisfaction in teachers are presented in Tables 8.10-8.12.

8.4.2.1.Gender

Only the tendency for female teachers to mention the hours allocated to their subjects was sufficiently evident for comment (Table 8.10). It does seem hard to explain, however, although a possibility may relate to a difference in approach to the curriculum in female teachers. Gysling (1992b) has shown that teachers adjust the curriculum in length or depth depending on the expectations and socio-economic status of the students they teach. If the curriculum is reduced for other reasons also, such as allocation of time to the subject, then female teachers may feel less comfortable than their male co-workers with the need to compromise.

Table 8.10: Distribution of dissatisfaction responses based on teacher gender

	Gender		
Hours allocated to speciality subject	**Female (% of 19)**	**Male (% of 8)**	***χ^2 statistic (d.f.=1)***
	37	0	34.0

8.4.2.2.Administration

No variation by age, experience or subject appeared specifically apparent, although analyses between dissatisfaction sources by school administration were more rewarding. Teachers from municipal schools, as might be expected from these lesser-funded institutions, report greater dissatisfaction with their salary, resources and computer facilities (Table 8.11). They also show a predisposition to mention student background as a source of dissatisfaction, a factor again understandable as these schools are likely to attract students of lower socio-economic status.

Table 8.11: Distribution of dissatisfaction responses based on school administration

		School administration		
Category		***Municipal School (% of 10)***	***Private Subsidised School (% of 17)***	***χ^2 statistic (d.f.=1)***
Salary		80	41	3.8
Student characteristics	Student background	20	0	3.7
	Student characteristics in school	30	29	0.0
Total		40	29	0.3
Resources		60	24	3.6
Computers		20	0	3.7

8.4.2.3.Location

It is possible that schools in La Serena and Coquimbo differ in the infrastructure and resources available to their schools (Table 8.12) and that these, especially the lack of resources, are a source of dissatisfaction for a much greater proportion of teachers than in La Serena. These findings may finally explain some of the other differences in student achievement, student attitude and teacher values described previously (Sections 6.4.6; 6.2.1; 6.6.5; Chapter 6).

Table 8.12: Distribution of dissatisfaction responses based on school location

	Grouping	**Location of school**		
Category		**La Serena (% of 21)**	**Coquimbo (% of 6)**	***χ^2 statistic (d.f.=1)***
Resources		24	83	7.1*
Infrastructure		24	67	3.9

Both student attitudes and achievement may be affected directly by the lack of adequate materials, as laboratory and practical learning has been argued elsewhere to improve these student outcomes (Piburn & Baker, 1993; White 1996). Although achievement

was consistently better in La Serena, as were attitudes to Physics, the reverse is true for attitudes in Biology and at times Chemistry. This suggests that in Physics at least, the use of extra resources, perhaps in practical work, may improve student attitudes and achievement. One may refer back once again to the possibility that Physics is a subject where more specific resources are required and it suffers specifically, in terms of failing to stimulate student interest and performance, when resources and infrastructure are not adequate.

Teachers in Coquimbo also tend to value physical working conditions more than colleagues in La Serena (Section 6.6.5; Chapter 6) and the mention here of poor resources and infrastructure supports the view that teachers who value physical working conditions highly are likely to be disappointed and experience dissatisfaction with respect to this job facet. Conversely, teachers who see their physical working conditions as poor may begin to value these conditions more, because the lack thereof has made the issue salient to them. The exaggeration of values when characteristics are seen as inadequate support this (Section 7.3.4; Chapter 7). Teachers were also shown to value personal and professional development more highly in Coquimbo. Differences in responses on issues such as in-service training, however, were negligible, although the little difference there was, came from teachers in Coquimbo who mentioned this category more frequently, (Table A14.08; Appendix 14).

8.5. Herzberg's two factor theory

A classification of the sources of satisfaction and dissatisfaction will now be made in order to further the understanding of the sources of satisfaction and dissatisfaction that have arisen in this chapter. The two-factor theory (Herzberg *et al.*, 1959), discussed in Section 2.10.2, was used as means of initial comparison and arising from that, two questions need be addressed: is the job facet extrinsic or intrinsic in nature, and is it capable of causing affect in only one direction?

Consider first the extrinsic /intrinsic nature of the categories formed in this research. In the satisfaction themes, the role of developer and working with students may be considered intrinsic to the job of teaching. If a broader description of "intrinsic" that encompasses all cognitive, non-environmental components of the job is accepted, then other factors such as personal growth, vocation, autonomy, enjoyment of speciality subject, training and recognition and respect may also be classified in this fashion.

However, facets that form part of the working environment, *extrinsic* factors, such as relationships formed, climate, resources, infrastructure, timetable and external rewards were quoted also as sources of satisfaction. This leads to the conclusion that both extrinsic and intrinsic components of a job contribute to feelings of satisfaction in partial contradiction of the two-factor theory. Criticism of Herzberg's two factor theory as being over-simplistic (Nias, 1989), therefore, seem to have been borne out as factors both intrinsic and extrinsic to the job cause satisfaction in the teacher.

King (1970) points out, however, that the two-factor theory is open to several interpretations. If one combines the percentages of factors considered to be intrinsic to the job, one does find that the *majority* of comments made by teachers on the sources of satisfaction (87%) are intrinsic; only 13% being extrinsic in nature[11]. Therefore, if the two-factor theory is interpreted as meaning the majority of job components that cause satisfaction are intrinsic to the job, and the majority of factors causing dissatisfaction are extrinsic, then the theory becomes acceptable in this application.

When reviewing the categories of dissatisfaction formed in the present study one observes that the majority of the responses (62%)[12] could be connected with the extrinsic component of the job or the environment in which the job takes place (namely salary, status, pupil number, parental support, resources, relationships with colleagues, computers, timetable and infrastructure). The remaining scales were harder to classify but training, student characteristics, quantity of work and the hours allocated to the speciality subject favoured the intrinsic in their description. If, however, as described previously, the two-factor theory is interpreted in terms of the majority of factors being extrinsic in nature, then it is to a degree applicable to the teaching field.

Nias (1981) describes the fine line that runs between classification into job attributes, which may be considered intrinsic and extrinsic. She states that the teacher and the student would find it hard to remove themselves from the social environment of the institution in which they work and that many contextual factors, classified in other professions as extrinsic, in teaching are directly linked with facilitating or impeding the teaching process and, therefore, become intrinsic in their nature. It is difficult in the

[11] The miscellaneous and school characteristics scales were excluded from this total as they contained items both extrinsic and extrinsic in nature.

[12] The miscellaneous category is excluded from this calculation

present analysis to discover what dissatisfying factors teachers might have felt directly affected their teaching but arguments could be put forward strongly as to how improved resources, infrastructure, pupil numbers, parental support, training and computer facilities might assist in instruction.

Some seemingly extrinsic job components are easily transferable to the intrinsic realm. Pupil numbers, for example, reduce the time spent in individualised instruction and increase problems in discipline and management. Resources and infrastructure are similarly influential. Laboratory facilities can arguably increase motivation in science instruction, as can adequate resources. Computer facilities may also improve instruction efficiency and motivation and increased workloads and lack of time inhibit the amount of class preparation time available to the teacher.

Salary would appear to be obviously extrinsic in nature but are teachers capable of separating financial concerns (if salaries are extremely low) from their classroom activity? In Chile, where salaries are low, some teachers are forced to work in two institutions or hold down more than one job. This is likely to contribute to the workload and time committed to students and this can only affect instruction adversely.

The second question that must be addressed when considering the two-factor theory involves whether the presence or absence of a job attribute will cause satisfaction only and not dissatisfaction (satisfiers), or *vice versa* (dissatisfiers). The findings of this study would indicate that the assertion that job attributes cause only either dissatisfaction or satisfaction must be disputed as there are several factors that fall under both satisfaction and dissatisfaction categories in this analysis. Salary/external rewards, student characteristics, relationships with parents/parental support, infrastructure, relationships with colleagues, status/recognition and respect, training and time tabling are such examples. This indicates that some job facets may cause an affective response in either direction.

In finding that intrinsic factors were capable of causing dissatisfaction, as well as satisfaction, Nias (1981, 1989), suggested the formation of a third division termed negative or *non-satisfiers*. These factors cause dissatisfaction but if corrected may cause active satisfaction. The job attributes listed in the previous paragraph would fit into this third class.

Few job attributes remain that might be classified as pure *dissatisfiers*. Pupil numbers, the hours allocated to the speciality subject, computer facilities and the quantity of work are the few examples uncovered here. If present, they appear to cause dissatisfaction but, in the Chilean context, they do not appear to be capable of causing satisfaction.

Large class numbers are likely to cause dissatisfaction amongst teachers due to the pressure they place upon the teachers in terms of workload, discipline and classroom organisation. Reducing class sizes would appear not to cause teachers to be actively satisfied, however, appearing only to neutralise dissatisfaction, with no positive stimulation being achieved.

An excessive workload is a definite cause of dissatisfaction with the job but, with the adverse effects it has on classroom preparation and stress, it is unlikely to be a source of satisfaction. It is equally unlikely that teachers will report satisfaction with a low workload (if anything they may report this as a source of dissatisfaction due to lack of stimulation and boredom). Similar logic applies to the hours allocated to the speciality subject category in that if sufficient hours are provided the teacher will not be actively dissatisfied as they have sufficient time to complete the curriculum to the depth they desire but there is little be gained in the form of active stimulation, if adequate time provision is made.

Finally, it was surprising that the provision of computer facilities did not appear as a source of satisfaction as well as dissatisfaction as had been the case with the infrastructure and resource categories. A possible reason job attributes do not appear in the satisfaction list is that in reality these attributes do not exist at levels with which they could cause satisfaction and it is not that they are incapable of causing satisfaction. Computing facilities might cause active satisfaction as well as dissatisfaction but few schools appeared to have computer facilities readily available to either the teaching staff or the students and those that did, appeared to be under utilising these facilities due to lack of technical knowledge. An external measure of job attributes might clarify this issue in the future.

Referring to the sources of satisfaction categorised, true *satisfiers* would appear to be encompassed by the categories of vocation, personal growth, role as a developer and the

characteristics or programme of the school that if present cause satisfaction. A lack of vocation, opportunities for personal growth in work or the absence of a convergent educational programme in the school did not appear to be a source of dissatisfaction. This may be either that teachers in the sample consider themselves to have chosen work they want to do, to be developing as individuals within the job and be in schools that share their educational values. If these factors are not present in their working lives, the lack thereof is not a source of active dissatisfaction but creates only some feeling of neutrality.

The sources of satisfaction and dissatisfaction categorised in this research, therefore, point to the fact that the two-factor theory may be loosely applied to the sample and context treated here in that there appear to be some factors that cause satisfaction or dissatisfaction alone. Furthermore, the majority of factors causing satisfaction are intrinsic and the majority of factors causing dissatisfaction contextual. The third group of non-satisfiers need to be included, however, to cater for job attributes that cause both satisfaction and dissatisfaction. Care must be taken also in the classification of what is extrinsic and intrinsic based on the nature of the career under study. Teaching, as with other service based careers where social interaction is essential to the profession, may be more prone to contextual influence (especially that of relationships formed with peers and clients) than are other professions (such as engineering and accountancy as studied by Herzberg).

A final criticism of Herzberg's motivators and hygiene factors lies in the fact that there would appear to be the possibility of a correlation between some factors in both categories that may distort the theory. Recognition, classified by Herzberg as a satisfier, could arguably be associated with status, a dissatisfer/hygiene factor. Similarly, advancement, classified as a satisfier, is closely associated with the disatisfier of salary. How teachers and researchers define these concepts would add further confusion to how job attributes are classified.

8.6. Comparison with quantitative data

As two methods, one quantitative (Chapter 7) and the other more qualitative (described in the present chapter) seek to determine which teaching job characteristics are key to worker feelings of satisfaction, it is of some use to compare, or triangulate, the results of the two so as to give greater support to any conclusions that may be made.

It was important for validation of the teacher questionnaire, beyond that achieved in instrument development, that the Likert type scales be proven to address issues relevant to *Chilean* teacher satisfaction or dissatisfaction. If one reviews the Likert scales employed in the teacher questionnaire (Appendix 6), an overlap between these scales and the categories of teacher responses derived from the freer expression of their sources of satisfaction and dissatisfaction through open-ended questions, has occurred to a high degree. If one assumes that through the "pre" and "during" questionnaire technique employed, teachers are reporting what is important to their satisfaction, and not simply repeating what they have read in the questionnaire, then the similarity between scales and categories supports the validity of the Likert section of the instrument and conclusions drawn from it. Table 8.13 better explains the convergence between the two question types.

Table 8.13: Areas of convergence between Likert scales and open-ended categories

Likert scale	***Equivalent open-ended category**
Relationships with colleagues	Relationships with colleagues (s)
Workload	Pupil number; Workload (d);
Management and morale	Relationships with management (s); Climate (s)
Community/school relations	Relationships with parents (s); Parental support
Career advancement	Recognition and respect (s); Status (d);
Personal and professional development	Training (s); In-service training (d)
Work content	Vocation (s); Speciality subject (s); Personal growth (s)
Student characteristics	Student achievement (s); student interest (s); Student characteristics (s)
Material rewards	External rewards (s); Salary (d)
Physical working conditions	Resources (s); Infrastructure (s); Computers (d)

*s = satisfaction category; d = dissatisfaction category

The majority of the Likert scales in the questionnaire covered areas that were viewed by teachers, responding to the open-ended section, as sources of satisfaction or dissatisfaction. Reference to responsibility for administrative tasks and student progress were notably absent in the open ended questions which indicates that teachers were either not widely involved in such activities or if they were, their feelings towards these activities were fairly neutral, with teachers deriving neither satisfaction or dissatisfaction from them. In future work, where an abbreviation of the instrument might be necessary, sacrificing these two scales would be recommended.

When considering what the Likert part of the questionnaire *did not* cover, the greatest concern lay with the lack of scales that make reference to the role of the student in

teacher satisfaction. Although student characteristics, achievement and interests are present in the Likert scale of student characteristics it becomes obvious from the open ended questions that satisfaction/dissatisfaction with students needs to be covered in much greater detail in the future. Inclusion of student development, relationships with students, working with young people, the student's background and behaviour should be made. It is of similar importance in future work to include scales associated with the satisfaction teachers derive from their roles as developers, not only of the students they teach, but their position in this role in society as a whole.

Items or scales involving satisfaction with the appropriateness of pre-service training, timetable considerations and allocation of time to the speciality subject, school programme or ethos and professional autonomy (a scale that had to be discarded here due to low reliability) could further improve the instrument. These themes, although appearing less frequently than student interaction and developer roles, would assist further in the quantification of Chilean teacher satisfaction.

Although the themes that arose in the Likert scales and the open ended questions proved similar on the whole, it is difficult to extend triangulation to a comparison of the *degree* of satisfaction felt rather than simply whether the satisfaction theme had been mentioned or not in both methods. The only indication of the weighting of each theme in the open-ended questions is the percentage of teachers who quote the category in their reports. A comparison between the Likert scales seen as most influential in their influence upon overall job satisfaction (Section 7.3.6; Chapter 7) and the free response categories mentioned by the most teachers in the sample was made, therefore, and presented in Table 8.14.

Table 8.14: Comparison of most influential Likert scales with satisfaction and dissatisfaction categories mentioned by the highest percentage of teachers

Most influential Likert type scales	Satisfaction categories described by the highest percentage of teachers	Dissatisfaction categories described by the highest percentage of teachers
	Working with students (joint category) (74%)	
	Human relationships (joint category)(53%)	
	Role as a developer (joint category)(47%)	
Relationship with colleagues	Relationships with colleagues (32%)	
	Student characteristics (29%)	
Work content	Personal growth (26%)	
Career advancement		
Material rewards		Salary (56%)
		Quantity of work (joint category) (37%)
Physical working conditions		Resources (37%)
Physical working conditions		Infrastructure (30%)
		Student characteristics in school (30%)

Using this as some indication of the importance of the job component (and ignoring the joint scales) relationships with colleagues, student characteristics and personal growth are the themes reported by the greatest percentage of teachers (32, 29 and 26% respectively) as a source of satisfaction whilst salary, resources and infrastructure are mentioned by the highest percentage of teachers as a source of dissatisfaction (56, 37 and 33% respectively). When comparing these results to those achieved by regressing the Likert scales onto the overall job satisfaction scale, one finds that the relationships with colleagues scale again features as one of the strongest job components in its influence on overall job satisfaction. The work content scale, (partially described in the personal growth category), material rewards (salary and external rewards) and physical working conditions (infrastructure and resources) are also confirmed. The importance of career advancement scale was not echoed in importance in the open-ended questions where the related status and recognition and respect scales are mentioned by a lesser 22 and 17% of the responding sample, respectively. The student characteristics Likert scale also did not feature in those of influence upon overall job satisfaction, but it is clearly a central issue when open-ended questions are analysed. This again points to the necessity for the development of scales that assess teachers' satisfaction with student related components of the job more thoroughly.

The results in the two methods are not directly comparable as the quantitative draws information only on satisfaction, whereas the open-ended question allows for the fact that satisfaction and dissatisfaction may not be present on the same continuum. However, there is some suggestion that amiable relations with one's working peers, the stimulation received from teaching itself, the material rewards received (especially salary) and physical working conditions (as described by adequate resources and infrastructure) in which one practices the profession, are paramount in determining teacher satisfaction. These components, therefore, need to be addressed, in preference to other alternative remedies such as increased autonomy or decision making power or reduced workloads through job simplification/reduction (Duke, 1984).

In summary, this chapter has shown that the sample of Chilean teachers derived most satisfaction from their working with students, the role teaching gave them as a developer within society and the relationships they formed as a result of working in the profession. Dissatisfaction was greatest with the poor salaries received, poor resources as well as poor working relations with colleagues and work over-load. These results have not been unexpected and confirm empirically much of the literature drawn from the region.

Reports of satisfaction and dissatisfaction are reliant to some degree on the characteristics of individual teachers and the institutions in which they work but these are not as marked as might have been expected, being emphasised in the sources of satisfaction, with sources of dissatisfaction being more universal.

The job attributes seen as sources of satisfaction and dissatisfaction were in some agreement with the two-factor classification (Herzberg *et al.* 1959) but the addition of the non-satisfier group as recommended by Nias (1981) is supported and the intrinsic/extrinsic dichotomy outlined by Herzberg *et al.* (1959) seen as over simplistic.

The comparison of these qualitative findings with the Likert scales has led to the validation of these latter scales although greater coverage of student related sources of satisfaction and the role of the teacher as a developer need to be considered. Triangulation of results with those discussed in Chapter 7 has been achieved, with the general conclusion that relationships with colleagues, work content, material rewards

and physical working conditions are job attributes that need to be addressed or redressed if job satisfaction amongst this sample is to be improved.

CHAPTER 9 THE RELATIONSHIP BETWEEN TEACHER JOB SATISFACTION AND STUDENT OUTCOMES

With the background now established in previous chapters, this chapter has the aim of investigating the associations between teacher overall job satisfaction, perceptions and valuations of specific job attributes on the one hand and student attitudes to science, beliefs of teacher job satisfaction and achievement on the other. Interrelations between these latter three student outcome variables will also be investigated. Background characteristics found to be of significance in Chapter 6 were controlled for in all associations investigated, so as to determine the independent predictive power of the main variables of interest. The structure of the chapter is outlined in the following hypotheses as drawn from and illustrated in Figures 4.01 and 4.02 (Parts E, F and G) (Chapter 4).

- **Hypothesis 1:** Teacher overall job satisfaction is associated with student perceptions/beliefs thereof.
- **Hypothesis 2:** Students' beliefs about their teachers' job satisfaction are related to their attitudes towards science as a career, the science subject and /or science teacher.
- **Hypothesis 3**: Student attitude towards science as a career, the science subject and/or science teacher is associated with student achievement
- **Hypothesis 4:** Teacher overall job satisfaction is related to student attitude towards science as a career, the science subject and/or the science teacher.
- **Hypothesis 5:** Student perceptions of teacher job satisfaction are related to student achievement
- **Hypothesis 6:** Teacher overall job satisfaction is related to student achievement
- **Hypothesis 7:** Teacher reports of job characteristic rewards and/or values are associated with student perceptions of teacher job satisfaction
- **Hypothesis 8:** A relationship exists between teacher reports of job characteristic rewards and/or values and student attitude to science as a career, the science subject or the science teacher.
- **Hypothesis 9:** Teacher reports of job characteristic rewards and/or values are associated with student achievement.

9.1. Forms of data analysis

The main difficulty facing the statistical manipulation required to investigate these hypotheses is the need to associate student individual level data with a level higher in the educational hierarchy, i.e., the teacher or the school. To achieve this, aggregation of the student level data into class averages may be calculated or alternatively, disaggregation of the teacher or school level data may be performed. This requires the replication of each teacher related variable value for association with every individual student involved. Both analysis types were made here:

9.1.1. Aggregation

Continuous student level data was aggregated into class means and, using stepwise multiple regression analysis, regressed onto teacher and school variables[13]. Using the class as the unit of analysis (CUA) many individual student level values are condensed into a few representative ones (in the form of the class mean). There are some limitations to this procedure:

Much of the information at the student level of analysis is lost during aggregation procedure and there is a danger of making conclusions at the wrong level, i.e., drawing a conclusion about the individual student from a class mean when one can only really make conclusions about the class. There are also certain non-continuous characteristics for which aggregates were not made (e.g. student gender) that had to be removed from analysis.

9.1.2. Disaggregation

Alternatively, where two student variables were related, disaggregated student data was utilised in a multiple stepwise regression analysis. Using the student as the unit of analysis (SUA) has the advantage of allowing for an analysis of variance at the level of each student. Disaggregation of teacher or school characteristics, however, inflates a few teacher/school level units into an artificially large sample, from which many more significant often spurious relationships are likely to be drawn than would have been the case with the smaller sample which represents the true sample size (Hox, 1995). Student level disaggregated analyses (SUA) were only conducted where relationships

[13]. Stepwise regression was utilised in an attempt to counteract colinearity between variables and locate variables of the greatest predictive power.

between student level data (e.g., achievement and attitude) were being investigated and teacher level variables were not included in these analyses.

Disaggregation further violates the assumption that all measures of the variable are independent of each other, where in fact, for class (e.g. the teacher) and school (e.g. administration) level variables, the data has been replicated to match each student. Furthermore, at the student level, students in a school or a class are more likely to have more in common than those in other schools and classes (Keeves & Sellin, 1990) which again transcends the assumption of independence, leaving between group variance unaccounted for.

9.1.3. Multi-level modelling

A third analytic technique, multilevel modelling (MLM), was employed, where the disadvantages of both the previous two manipulations may be overcome through simultaneous analysis of both student and class level variables. Multilevel modelling is suitable for studies where data is thought to be hierarchical in nature. This statistical procedure avoids the disadvantages of techniques where data is aggregated into group scores (e.g. individual student achievement scores aggregated into a class scores) that ignores the variation that may exist between units (in this case students) of the hierarchical level at which it occurs (Ridell, 1989; Jansen, 1995). It also recognises where duplication of the data has been made, identifying each variable according to the level of analysis it belongs.

A full discussion of the theoretical background of MLM is not appropriate here and can be viewed elsewhere (Goldstein, 1986; Goldstein, 1987; Gray, 1989; Heyneman, 1989; Lockheed. & Longford, 1989; Paterson & Goldstein, 1991; Woodhouse. & Goldstein, 1996; Goldstein *et al.*, 1998) but some basic theory has been discussed briefly to assist in the understanding and interpretation of the results presented in the analysis tables. Such discussion can be reviewed in Appendix 15.

In the present research, a first hierarchical level is taken as those data of, or variables measuring, the characteristics of the individual student, each student contributing to the variation at this level. Level two views the student group together in a class as the next hierarchical level. Each class may have its own peculiarities as a group, which contributes to the variation at this level of analysis. Variables associated with the

teacher (e.g. overall job satisfaction) fall into this category, as do school variables (e.g., school administration). This is particular to the present research design where only one subject teacher and one class per school were selected, making teacher variables and school level variables part of the same hierarchical level. This would not have been the case if several similar subject teachers had been chosen per establishment or if more than one class had been sampled per school.

The percentage of total variance explained by variation between classes/schools (level 2 variance) is presented in Table 9.01 where it can be observed that in general variation at this level is of sufficient proportions to admit the presence of a hierarchy in the data collected and to view MLM as essential in these analyses.

Table 9.01: Percentage of total variance explained by level two for student dependent variables.

	Subject	*Physics*	*Biology*	*Chemistry*
Dependent variable		**Percentage of total variance explained by level 2**		
Attitude to class		3.1	8.1	14.5
Attitude to teacher		27.7	20.6	35.5
Attitude to science as a career		0.6	0.6	0.6
Student perceptions of teacher satisfaction		12.7	14.7	20.5
Independent test scores		11.1	27.3	19.2
Term marks		35.4	26.1	27.9

Based on the advantages proposed in favour of MLM, it would seem advisable to abandon the results of the first two regression SUA and CUA analyses. However, the number of groups/classes (17) at the second level of the hierarchical structure (teacher/school) is less than ideal (Goldstein, 1987) and results need to be treated with caution. Relationships are discussed, therefore, reviewing the results of all three analyses concurrently rather than selecting one technique alone. The aim was not to make a comparison between the methods. Each of the methods contain drawbacks and if reviewed together, it is hoped they will confirm and increase confidence in the results obtained and assist in the determination of where relationships might be associated with statistical manipulation rather than reality.

9.2. Results and discussion

The testing of each hypothesis is presented separately and for the purpose of clarity, only significant results of the main variables of interest are presented, after relevant

background variables (identified in Chapter 6) that contribute to the model have been controlled. Preliminary analyses whereby only the exploratory variables of interest were involved in the regression in simple modelling, have been excluded, as have coefficients for the relevant background variables, level 1 and level 2 variance, deviance statistics in the MLM technique and percentage variance explained in the SUA and CUA analyses. This has been done to encourage flow within the text. A comprehensive presentation of the analyses that include such detail and where both significant and non significant results are presented, can be viewed in Appendix 16.

9.2.1. Hypothesis 1: Overall teacher job satisfaction is associated with student perceptions thereof.

The overall job satisfaction of the teacher did not coincide with the perceptions that students had of teacher satisfaction in either Chemistry or Biology classrooms. A significant result was found in Physics in the preliminary analysis (Table A16.01; Appendix 16), although when background variables were controlled, the significance of this result was lost (Table A16.02; Appendix 16).

The lack of relationships between teacher overall job satisfaction and students' perceptions thereof suggest that the overall job satisfaction scale is too abstract a scale for relationships to be found with student beliefs. Alternatively, this construct may be situationally far removed from student outcomes as it measures teacher attitudes of which students may not be aware or which they actively misinterpret.

Alternatively, the predisposition of direct questioning in the creation of rhetoric or an ideological response may be a further consideration (Lortie, 1975). When instruments are being developed, evidence shows that more indirect measures of job satisfaction are less susceptible to socially conditioned responses than direct measures (Kottkamp, 1990). As the overall scale would appear to be the more direct scale, this may explain why the overall job satisfaction scale was not of much success in this research in comparison to the more indirect (as well as more specific) job component scales (shown later in this chapter). This assumption is made on the premise that the less rhetorical and ideological the answer, the more likely is the report to reflect the true feelings of the teacher.

Although the overall job satisfaction scale does have two of the six responses being direct in nature (i.e., specifically asking about satisfaction), it is difficult to say unequivocally that the job components scales are in fact very much more indirect, especially as the value section of the job component scales does also mention satisfaction in the header part of the question (see Apppendix 4 and 5). It may be, then, that the greater specificity of the job component scales is the main reason for the greater predicitve success of individual job scales, if compared to the overall job satisfaction scale. In the case of the reward components that do not make reference to satisfaction, however, the lower probability that teachers will succumb to social conditioning, can be considered an additional advantage.

Several scenarios can be imagined in which students may incorrectly guess at their teacher's state of overall satisfaction. A teacher may feel, for example, that she would not re-enter the profession if she had the decision again but, now that she is in teaching, these general feelings are not discussed or are not strong enough to be displayed to the student even inadvertently. Students might also be expected to misinterpret the state of satisfaction of teachers who derive most of their general contentment from sources within the profession other than teaching in the classroom (e.g., participation in management or the social mobility the profession may afford). Finally, teachers who make report of lower levels of overall satisfaction (however formed) may still exhibit behaviour in the classroom that would seem to contradict this. Known inconsistencies between behaviours and attitudes in the general attitude literature (e.g., Ajzen & Madden, 1986) would confirm this. Similarly, teachers, as rational actors aware of their behaviours and the motives behind them, may be professional enough to purposely hide their feelings from their students. It should also not be forgotten that the relationship between a teacher's overall job satisfaction may differ from one context to another. He may enjoy his job in general, but find one particular class hard to control, his mood and demeanour in this class being distinct from what it might be in others.

Although students did not make correct predictions concerning the overall job satisfaction of their teacher, there was the possibility that they failed to do so because they were simply not able to express their own perceptions accurately not having given the subject much conscious thought previously. Moreover, as the satisfaction of the teacher may be something the students can only guess at, the strength with which they hold these beliefs may not be particularly strong. Students, however, may still be

affected at a less conscious level as demonstrated in their attitudes to the class, teacher or science as a career.

9.2.2. Hypothesis 4: Teacher overall job satisfaction is related to student attitude towards science as a career, the science subject and/or the science teacher.

It appeared that teachers' feelings of overall job satisfaction, in addition to not being linked to student beliefs (Section 9.2.1), were not associated with student affect either. No relationships between student attitudes in Chemistry and Biology arose in the preliminary analyses although a single relationship was observed once again between students' attitude to their Physics class and overall job satisfaction of the teacher (Table A16.03; Appendix 16). Although some potential had seemed evident in this relationship between the students' attitude to Physics classes and overall job satisfaction, controlling for background variables showed this relationship to be unlikely (Table A16.04; Appendix 16).

Overall job satisfaction as measured and analysed here, would seem again a construct either too abstract in its definition and/or too far removed from student outcomes to be worthy of further direct consideration when trying to improve student attitude. Overall job satisfaction may still interact with student achievement, however, although not through the measured path of student perceptions and attitudes. Measures of a direct relationship between achievement and overall job satisfaction were, therefore, made.

9.2.3. Hypothesis 6: Teacher overall job satisfaction is related to student achievement.

Similar patterns seemed to emerge in this analysis to those that had been observed previously, i.e., the only relationship of interest was that between a measure of Physics achievement and the overall job satisfaction scale (Table 16.05; Appendix 16). It proved encouraging that the inclusion of background variables using the MLM and CUA techniques (Table 9.02) did not negate this relationship as they had previously.

Table 9.02: Relationships between overall job satisfaction and student achievement

Independent variable	Dependent variable	Significance	Method of analysis
Teacher overall job satisfaction	Physics independent test score	**/*	MLM/SUA

After control of background variables, such as students' natural ability (Table16.06; Appendix 16), it would seem that a student's achievement in science may be better if the teachers' overall job satisfaction is higher. There is always the possibility that type I errors are being made in accepting the relationships between student achievement in Physics and teachers' feelings of overall job satisfaction and that the null hypothesis- *no relationship exists between overall job satisfaction and student achievement*- has been incorrectly rejected. However, if one tentatively accepts the connections found, one must consider why only Physics achievement is specifically influenced and not that of Biology and Chemistry.

One suggestion is that there is some occurrence in the Physics classroom culture that causes an association between student achievement and teacher overall job satisfaction. No significant differences were found in the overall job satisfaction of different subject teachers (Section 6.6, Chapter 6) which may indicate that although Physics teachers do have levels of overall job satisfaction similar to those of their Biology and Chemistry colleagues, they demonstrate such feelings in the classroom to a greater degree. This is supported by the fact that student attitudes to Physics classes, the Physics teachers and perceptions of the teacher satisfaction are generally lower than for the other subjects, especially in comparison to Biology (Section 6.2, Chapter 6). Further exploration of this hypothesis, however, is necessary in future research. Investigating personality traits, behaviours and other attitudes held by these subject teachers, for example, might be useful to determine what factors make these teachers express their feelings of satisfaction more evidently.

As the link between student Physics achievement and teacher overall job satisfaction was not well explained by a direct association either between overall job satisfaction and student perceptions or between overall job satisfaction and student attitude, the relationship must be explained alternatively. It has been suggested that teachers' sense of teaching efficacy may be related to their satisfaction with the various aspects of their working conditions. Furthermore, associations between teachers' sense of efficacy and student achievement in Mathematics, English language and Reading has shown these relationships to be subject specific (Ashton & Webb, 1986). These two findings led the latter authors to suggest that teachers in different subjects have different expectancies of the influence they are capable of having upon their students. If there is a connection between satisfaction and sense of teaching efficacy, as Ashton & Webb (1986) suppose,

then in the present research Physics teachers may consider their subject to be more difficult than might Biology or Chemistry teachers, and feel less able to make a significant impact upon students' learning. Physics teachers, therefore, may feel less satisfied overall as a result or, considering the reverse relationship, overall job satisfaction may help fuel these feelings of inadequacy. This may provide an explanation as to why the work attitudes of Physics teachers, traditionally seen as the harder science subject, shows significant associations with student achievement. That teachers in general felt Chemistry and Physics to be slightly more numerical, complex and masculine in nature is evidence of such traditional thinking (Goddard Spear, 1988). Future work might be directed to following up on a link between teachers' feelings of efficacy, the perceived difficulty of the subject and their overall feelings of well being in the job.

9.2.4. Hypothesis 2: Students' beliefs about their teachers' job satisfaction are related to their attitudes towards science as a career, the science subject and /or science teacher.

Although actual overall job satisfaction was not a good predictor of students' attitudes or perceptions, it is still possible that students' perceptions of teacher overall job satisfaction, however they may be formed, contribute to students' attitudes to science. Of course, attitudes to science may equally influence how the student perceives the teacher's overall job satisfaction. Bearing in mind the concerns that perceptions may not be firmly developed due to lack of prior thought on the subject, the latter is thought to be highly probable.

Table 9.03: Relationships between students' perceptions of teachers' job satisfaction and student attitudes to science.

Independent variable	Dependent variable	Significance	Method of analysis
Physics			
Student perceptions of teacher's job satisfaction	Attitude to class	***/**/***	MLM/CUA/SUA
	Attitude to teacher	***/**	MLM/SUA
	Attitude to science as a career	***/***	MLM/SUA
Biology			
Student perceptions of teacher's job satisfaction	Attitude to class	***/***/***	MLM/CUA/SUA
	Attitude to teacher	***/**/***	MLM/CUA/SUA
	Attitude to science as a career	***/***	MLM/SUA
Chemistry			
Student perceptions of teacher's job satisfaction	Attitude to class	***/**/***	MLM/CUA/SUA
	Attitude to teacher	***/**/***	MLM/CUA/SUA
	Attitude to science as a career	*/*	MLM/SUA

A clear relationship between attitudes to science and perceptions of teacher overall job satisfaction are found across all subjects and that, with the exception of the attitude to science as a career, across most statistical analyses (Table 9.03). The absence of significance in the CUA analyses in the latter scales suggests that where the teacher may influence the individual's attitude to science as a career, it is unlikely that the whole class cohort will be similarly affected, as the effect of numerous variables, other than the teacher, inside and out of the school establishment, will be unique to each student.

Further support is also provided to the possibility that attitudes to science as a career are more under the influence of variables external to the school than attitudes to the teacher and the class (or at least the ones studied in this research). This has been suggested elsewhere (Section 6.2.8; Chapter 6). Evidence is once again provided here through a review of the small percentage of variance explained in the attitudes to science as a career analyses (Tables A16.20, and A16.26; Appendix 16), even after the addition of relevant background variables. This may be compared to the much higher percentage of variance accounted for in the other two attitudes (Tables A16.18, A16.22 and A16.24; Appendix 16).

Causation cannot be assumed in an analyses of student perceptions and their attitudes to science, as the cross-sectional nature of the data (Bidwell & Yasumoto, 1999) and form

of statistical analysis, makes the direction of the relationship indeterminable. It is still tempting to speculate, however, on the possibility that positive student perceptions of teacher satisfaction improve student attitude to the subject. Alternatively, the reason students hold the perceptions they do may be largely owing to the influence of students' attitudes to various components of science. If these perceptions are not particularly well developed and/or defined reliance on these latter predetermined, better established attitudes to science may be all students have to draw upon when making a report on teacher satisfaction. The conclusions are consistent across the three subject domains.

In the analysis of these three subjects, it was interesting to note that the hierarchical nature of the data was not strongly evident in the analyses of the attitudes to the class and especially not in the attitude to science as a career scale (Table 9.01). However, the variance attributed to the class structure in the attitude to the teacher data is much higher. This indicates that in attitude to the teacher, students in a specific class are more alike in their attitudes than those in other classes. This is self-evident, perhaps, as each class is dealing with an individual teacher with individual characteristics and practices.

If the hierarchical nature of the attitude to teacher scale is compared with the lower contribution of the class structure to the variance in student attitude to class and the negligible contribution to the attitude to science as a career scale (Table 9.01), previous argument that these scales are under the influence of factors outside the classroom to a greater extent than the attitude to teacher scale, is supported. Therefore, the attitude to the class may be influenced by the way the teacher presents the subject to some extent but parental interest may also play a role. In the career scale, influences outside the class such as media presentation, may be even greater.

9.2.5. Hypothesis 3: Student attitude towards science as a career, the science subject and/or science teacher is associated with student achievement

It was shown that there was some consistency across subject areas in the relationships found between student attitudes to science and their achievement. This consistency across subjects highlights the generalisability of these relationships beyond the boundary of particular subject classrooms (Table 9.04).

Table 9.04: Effect of attitudes to science upon achievement.

Independent variable	Dependent variable	Significance	Method of analysis
Physics			
Attitude to science as a career	Independent test score	**	SUA
Attitude to class	Independent test score	*	SUA
Attitude to class	Term marks	***	MLM
Attitude to teacher	Term marks	**	MLM
Biology			
Attitude to science as a career	Independent test score	**/***	MLM/SUA
Attitude to science as a career	Term marks	*/*	MLM/SUA
Attitude to class	Independent test score	**/**	MLM/SUA
Attitude to class	Term marks	***/***/***	MLM/CUA/SUA
Chemistry			
Attitude to science as a career	Independent test score	*/*	MLM/SUA
Attitude to science as a career	Term marks	*/*	MLM/SUA
Attitude to class	Term marks	***/**/***	MLM/CUA/SUA
Attitude to teacher	Term marks	***/**/***	MLM/CUA/SUA

In both term and independent scores, across all subjects, relationships were found between attitudes to the science class and achievement. Therefore, if attitudes to the class are positive they may inspire student behaviour related to improved achievement. The potential of good achievement to generate good attitudes would also seem probable.

Relationships are consistently found between the students' attitude to science as a career and independent test scores across all subjects and with the term marks in Chemistry and Biology. Considering a positive linear relationships between student achievement and attitude to science as a career, there is the possibility that a good attitude to science as a future career motivates the student to work and perform optimally in this discipline. As with so many of the relationships found in this and other social science research, other alternatives cannot be ignored and need to be kept in mind. One such alternative favours the hypothesis that students achieving well in the sciences are likely to consider a career in this field rather than the reverse.

Another plausible suggestion, however, may be that students with positive attitudes to science as a career, and to the subject and teacher also, may have been more predisposed to participating in the research tests being undertaken. Tests and questionnaires, having science as a theme, may motivate such students to try harder and, in the case of the independent achievement and ability tests, achieve better. This made

the full co-operation of all students throughout the study a point of concern. Although the majority of students appeared to put maximum effort into the achievement, ability and attitude measures placed before them, there was no direct benefit to them to put in an optimum effort and one can only assume that such effort has been made.

Reviewing the relationships that emerged here between attitudes and independent test scores across the three subjects, most of the connections appeared to lie with the attitude to the subject/class and science as a career rather than with the attitude to the teacher. Attitudes to the teacher are only related to Chemistry and Physics term marks. This may indicate that attitude to teachers has a smaller influence on achievement itself, but is more involved with the pupil-teacher relationship. This may be true if one views term marks as more subjective in nature and affected by the said relationship, as well genuine assessment by the teacher. A teacher may be more predisposed to give students good grades if the relationship between student and teacher is good. On the other hand, students that receive good term marks may develop a better attitude to the teacher.

That relationships found between the attitude to subject and science as a career on the one hand and *both* independent test scores and term marks on the other, confirms to some small degree the possible influence of these attitudes upon achievement in general. Even though significant results have been detected, one needs to accept that, although attitude may influence behaviours related to good achievement, the relationship is not likely to be a consistent one as both behavioural intention and behaviour itself may be affected by other factors that may interfere with the influence of attitude. Some of these factors have been controlled for in the study, (e.g. intrinsic ability, socio-economic status), but many others exist that have not been considered, the influence of significant others (e.g. parents and peers) and perceived behavioural control (e.g., belief in their own ability) being examples (Fishbein & Ajzen, 1975; Ajzen & Madden, 1986).

In the instances where lack of relationship between student attitude and achievement was found, the emphasis in a school that is placed upon reaching further education could be considered. Students may not be particularly interested in the subject or dislike the teacher but be motivated to achieve therein so as to attain the wider goal of a place at university in the disciplines, such as medicine and science related degrees, where highest entry scores are required (Gysling, 1992b).

In general, it would seem, however, that in agreement with other authors (e.g., Wick & Yager, 1966; Simpson & Oliver, 1990), attitudes to some components of science are associated with student achievement, despite the threats to this relationship described above.

9.2.6. Hypothesis 5: Student perceptions of teacher job satisfaction are related to student achievement

It would appear that student beliefs about their teacher may translate into attitudes (hypothesis 2; Section 9.2.4), which in turn may be associated with achievement (hypothesis 3; Section 9.2.5). The alternative exists, however, that the association between beliefs and behaviours is more direct or follows some alternative route. The direct route was explored in the hypothesis that students' perceptions of teacher satisfaction are related to student achievement (hypothesis 5) and the results described in Table 9.05.

Students who felt that their teacher disliked the subject, his students or teaching in general may have found it more difficult to motivate themselves, all other factors affecting motivation being equal, than students who felt their teachers were positive about what they did. The teacher is likely to be a very significant other in the lives of students, one from whom they create their perceptions of what is worthy of their efforts and what is not.

Table 9.05: Relationships between students' perceptions of teacher job satisfaction and achievement

Independent variable	Dependent variable	Significance	Method of analysis
Biology			
Student perceptions of teacher's job satisfaction	Independent test score	**	SUA
Chemistry			
Student perceptions of teacher's job satisfaction	Independent test score	*	SUA
Student perceptions of teacher's job satisfaction	Term mark	*/***	MLM/SUA

While the only relationship between overall job satisfaction and achievement occurs in the Physics domain (Section 9.2.3), Physics is the only subject where a link between some measure of achievement and student perceptions is *not* found. This points to the

possibility that the manner in which teacher satisfaction is interrelated with student behaviour and achievement may be distinct in this subject discipline.

Chemistry was the only subject in which both independent and term marks were associated with students' perceptions of teacher job satisfaction (Table 9.05). It should be remembered that the term marks are the only indication of their performance that students have and that knowledge of this performance may influence the beliefs they hold about the teacher rather than the other way round. The fact that independent achievement scores are related also to student perceptions in Chemistry, however, favours the explanation that student performance is in itself influenced by student perceptions, in Chemistry at least, rather than that student perceptions are linked to some expression of the teacher-student relationship.

The hierarchical nature of the achievement data is very evident (Table 9.01). This means that students in the same class tend to be more alike in their achievement than those from other classes and justifies a MLM procedure with this data. It suggests that the school or teacher may be responsible for this clustering, students within the same class/school experiencing similar stimulations or inhibitions to their performance. This latter clustering was very much greater than that observed when attitudes (bar those towards the teacher) were used as dependent variables.

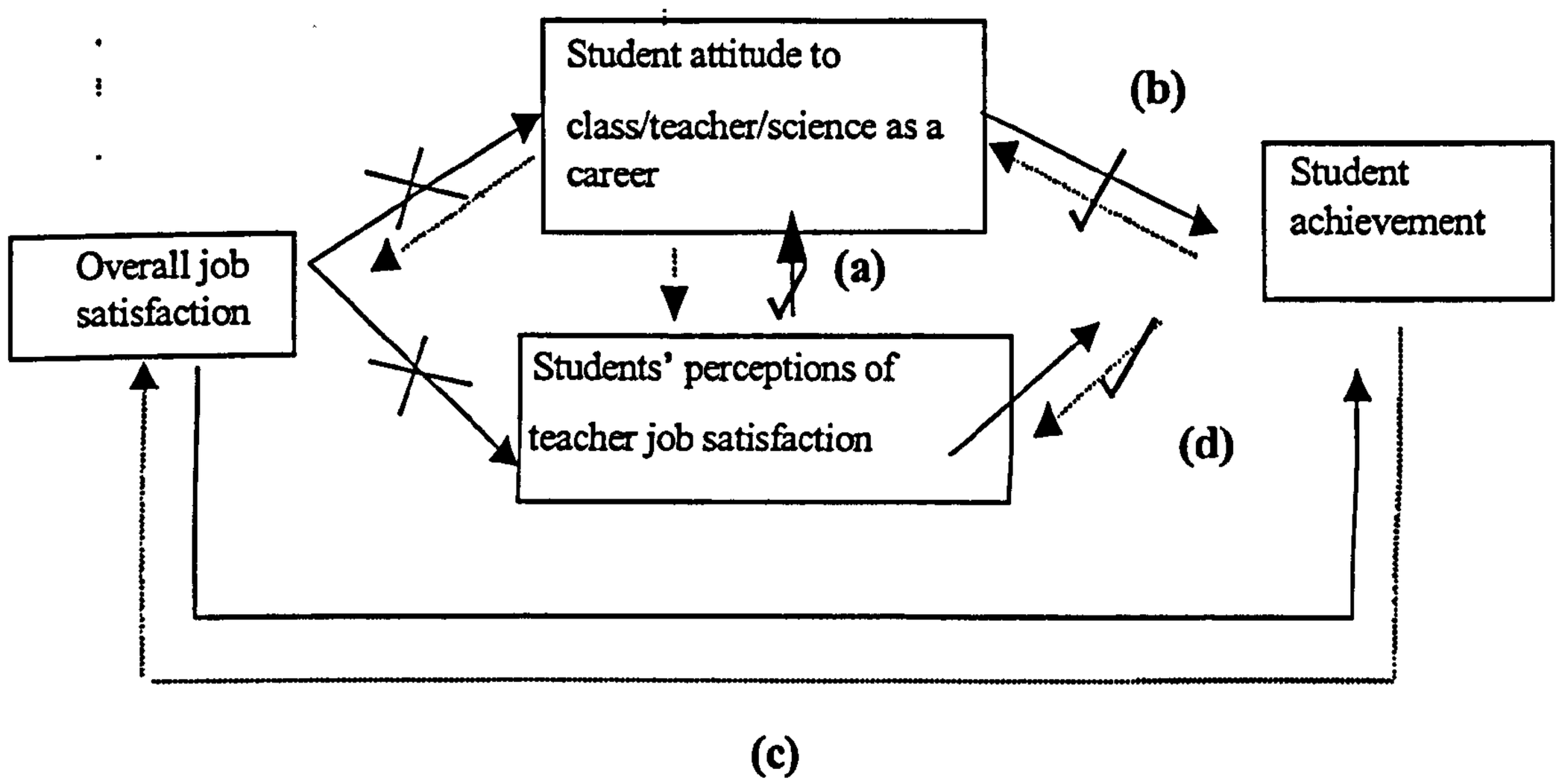
Level 2 variance was also much higher for term marks (in Physics and Chemistry) than was observed for the corresponding independent test scores (Table 9.01), an expected finding based on the added similarity within a particular class of the teachers' varied judgements on how marks should be allocated. The fact that level 2 variance for Biology independent and term scores were more or less on a par, indicates that these teachers might be fairer or less subjective in the marks they allocate.

Students' perceptions of teacher job satisfaction appear to be more strongly and consistently associated with attitudinal (hypothesis 2; Section 9.2.4) rather than achievement scores (hypothesis 5; as discussed in this section). This substantiates the work of Henderson *et al.* (2000) where associations between student perceptions of their teachers' interpersonal behaviour and of the laboratory environment, respectively, were more associated with students' attitude to the class and laboratory work than to cognitive or practical achievement.

Although student perceptions are significantly associated with achievement, they are by no means the main source of variance, with the variable of natural ability unsurprisingly being the most powerful predictor (Tables A16.28-A16.32; Appendix 16). Variables of socio-economic status such as mother's education and school administration (linked to school fees paid) also carry weight. Although it was expected that these would far outweigh the contribution of the teacher variables, this was not in fact the case and this points to the relative importance of the school in a developing country (Heyneman & Loxley, 1983; Saha, 1983).

Furthermore, far less variance in achievement is explained in total than was accounted for in the attitudes of students to science (Comparing Tables A16.10-16.24 [attitudes] with Tables A16.28-A16.32 [achievement]; Appendix 16). This suggests that performance is a more complex construct under the influence of a wider range of variables (more than are measured in this research at least), than are attitudes. Indeed, attitude itself may be one of these many variables that has an influence upon achievement.

Figure 9.01 summarises the findings outlined so far in testing hypotheses 1 to 6.



(a) Relationships across all subjects and attitudes to science

(b) Relationships between attitude to class and both independent test scores and term marks in all subjects;
Relationships between attitude to science as a career and independent test scores across all subjects;
Relationships between attitude to science as a career and biology and chemistry term marks;
Relationships between attitude to teacher and physics and chemistry term marks.

(c) Relationships with physics term marks

(d) Relationships with chemistry term marks and biology and chemistry independent test scores

Figure 9.01: Relationships found between overall job satisfaction and student outcomes

The next section of analysis reviews the relationships between teacher attitudes to specific aspects of the job and student outcomes. It was hoped that consideration of the expanded model (Figure 4.02; Chapter 4) would be more rewarding in its outcomes than a model that only considered an overall satisfaction scale (Figure 4.01; Chapter 4).

9.2.7. Hypothesis 7: Teacher reports of job characteristic rewards and/or values are associated with student perceptions of teacher job satisfaction

Although overall job satisfaction was not related to student perceptions (Section 9.2.1) there is the possibility that associations are found when dealing with teacher attitudes to specific attributes of the job. Reports of significant associations between teacher satisfaction *specific* to relations with pupils and other pupil attitudes, on the one hand, and student perceptions (e.g., pupil satisfaction in class, perceptions of the degree of

friction in class and the difficulty of work required of them in class), on the other, (Smilansky, 1984) support this premise.

In Chemistry, when background variables were controlled, the significance of teacher reports on material rewards (value), career advancement (value) and work content (reward and value) were retained after preliminary analyses in at least one of the analysis types. In Biology, the relationships between career advancement (reward) and material rewards (reward and value) remain significant (Table 9.06). The lack of significant relationship between student perceptions and teacher reports on specific job characteristics in Physics points once again to the alternative routes that need be traced when considering the association between teacher satisfaction and student outcomes within this discipline.

Table 9.06: Relationships between teacher perceptions and values to aspects of work and student perceptions of teacher job satisfaction

Independent variable	Dependent variable	Significance	Direction of relationship	Method of analysis
Biology				
Material rewards (reward)	Student perceptions of teacher job satisfaction	**/*	+/+	MLM/CUA
Material rewards (value)		*	-	MLM
Career advancement (reward)		**/**	+/+	MLM/CUA
Chemistry				
Work content (reward)	Student perceptions of teacher job satisfaction	*	-	MLM
Work content (value)		**	-	MLM
Career advancement (value)		**	+	CUA
Material rewards (value)		*	+	CUA

Where no relationships at all are found between student perceptions and overall job satisfaction, several associations could be made with reward and value scales. If it is accepted that students do form some belief system about their teachers' satisfaction, then looking at teachers' perceptions and valuations of specific job attributes would seem the option of choice when investigating the relationships between teacher job satisfaction and student outcomes. Students may be able to judge teachers' feelings on some job characteristics but be oblivious to others. They, therefore, misinterpret

teachers' overall feelings of satisfaction while remaining correct on specific job attribute satisfactions.

It was expected that students' interpretation of teacher satisfaction with specific job attributes would only be accurate in terms of teacher satisfactions with teaching itself and/or working with the student. These thoughts were initiated by the fact that, during development of the student questionnaire, an initial perception scale had included items that elicited students' perceptions of teachers' satisfaction outside the classroom, e.g., teacher satisfaction with their relations with colleagues and their physical working conditions. Not surprisingly, such items did not load onto a common factor in a factor analysis as had items where students reported on the teachers' contentment with teaching itself and the interest in the subject. Students seemed, therefore, to equate teacher satisfaction with the teacher's outward signs of contentment as they are revealed directly in the classroom, and their attitudes towards teaching itself. Students were uninterested or unaware of teachers' attitudes to other components of the job. This was not unexpected as there is little reason for students to be aware of teachers' opinions and feelings to components outside of classroom. This would be especially so if little social interaction occurs between students and teachers, as might be the case in larger, less personalised school environments.

It was anticipated, therefore, from the above manipulation of the student perception scale, that students' perceptions would have coincided with teachers' sentiments concerning job attributes, linked more with the classroom or the environment of the student. There may be certain job attributes cogent to teacher satisfaction with which students have direct contact as they form part of their own environment and to which students may have heard or seen their teacher react.

A division of scales into those in and outside the focus of the student was of use in an explanation of the significance of the work content (reward and value) scales in Chemistry (Table 9.05). The interest in the subject, teaching, the activities involved and the creativity that this stimulates are very much inter-linked with the classroom side of the teacher's working life and students may be able to read teachers' sentiments as a result. A negative linear relationship was detected between student perceptions of teacher satisfaction and both reward and value scales, which would appear to show that as work content became more valued by the teacher, the less satisfied did students think

their teachers to be. It is proposed, therefore, that teachers who value the content of their work greatly are more likely to be disappointed, this being reflected in their teaching practice. Teaching may also be a profession of compromise between what teachers may value and the reality that faces them. Teachers expressing high values may be less inclined to compromise and hold onto their value systems regardless of the reality that may push them to reallocate their valuation priorities.

The perceived amount of stimulation received from the content of work (or reward scale) was also linked with student perceptions in Chemistry. It was of some surprise, however, that this relationship was also negative, as it would appear that the greater the perception that teaching was a stimulating, interesting activity on the part of the teacher, the less likely are students to perceive their teachers as satisfied. This was difficult to explain and because of this anomaly, a second order or other non-linear relationship may be worthy of investigation in future research.

The argument that students should be affected by the satisfaction of teachers with factors only within the students' own environment was soon contradicted. Scales that measured teacher feelings towards job attributes, ostensibly beyond the vision of the student, such as the importance placed upon and the perceptions of the opportunities for career advancement and material rewards (Table 9.06), were also linked to student perceptions. Students, therefore, seem to be aware of teachers' sentiments on certain job attributes external to the classroom, being made aware indirectly through the form teacher behaviour takes in the class.

If connections exist between students' perceptions of job satisfaction and teachers' feelings towards the opportunities for career advancement (reward) the link may well be through the student observation of the teachers' levels of motivation or lack thereof in the classroom. This may be coloured by whether the teacher believes opportunities for career advancement, the equity with which it is approached in the school and whether their work is externally appreciated. Teachers who feel unappreciated or resentful are unlikely to be motivated to perform in the interests of the school in which they feel they are being unfairly treated. On the other hand, teachers who view career advancement as important (value) may be dynamic and ambitious individuals and such teachers may be seen by students as better satisfied than teachers who are more apathetic in their career approach.

Teacher valuation of material rewards was of significance in both Biology and Chemistry but where high valuations of material rewards coexisted with higher student perceptions of teacher satisfaction in Chemistry, the reverse was true in Biology classes. Teachers' beliefs of the adequacy of material rewards (reward) was only associated with student beliefs about teachers' satisfaction in Biology. As feelings connected with career advancement may infiltrate the environment of the classroom, Biology teachers who find material rewards inadequate, may also not be able to isolate their economic worries from their work with students.

Economic worries may take two forms. Firstly in motivation where a teacher may find it hard to justify the expenditure of the extra effort in preparation or making time for a problem child when there is little material gain for making this effort. Secondly, financial worries may provide some distraction for a teacher from her work if she is unable to partition off these concerns from her work environment. Dissatisfaction with material rewards may often force teachers in Chile into alternative simultaneous employment that may distract further from their teaching obligations. Furthermore, if the teacher views material rewards as a form of recognition, and material rewards are in reality low, high valuations of material rewards (value) will reduce teacher satisfaction and fail to motivate them strongly in the classroom, a factor likely to be noticed by at least some students.

The positive sign of the material rewards (value) scale in Chemistry would indicate that in this classroom culture, teachers who see material rewards as highly important are likely to have students that perceive them to be happier. Comparing this positive relationship to the negative association observed amongst Biology teachers, and knowing the financial reality of teachers in Chile, this relationship would seem unlikely. It is conceivable, however, that there are some teachers who view the fact that they have entered the teaching profession as a form of social and financial mobility and be very happy with the material rewards they receive. Perhaps these individuals are concentrated in the field of Chemistry. It must still be considered, however, that the signs of the relationship may be more related to statistical issues. Larger samples and/or the investigation of second order relationships, therefore, would be highly advisable.

Career advancement and material rewards are job attributes that can be argued to be outside of student sphere, and are scales of which students would not know their teachers' feelings. Both scales were shown, however, to contribute to teachers' overall feelings of satisfaction (Chapter 7). A possible conclusion, therefore, is that career advancement and material rewards are two job characteristics so important to Chilean teachers that they are reflected in teacher classroom practice. This in conjunction with what is shown here, that student perceptions are linked to teacher reports of these characteristics, suggests that teachers are bringing their strongest attitudes into the classroom, are expressing them in some externalised fashion, and that this is picked up by their students.

This argument cannot be fully supported, however, as it should follow that the relationships with colleagues scale would also appear among those of which the students become aware, but it does not. This may be an attribute that although important in the lives of teachers, can be effectively isolated by the teacher from the class environment.

9.2.8. Hypothesis 8: Teacher reports of job characteristic rewards and/or values are associated with student attitude towards science as a career, the science subject and/or science teacher.

9.2.8.1.Student attitudes towards the science class

It was shown in the previous section that investigating the relationships between student perceptions and teacher reports on specific job characteristics was more worthwhile than when only a single overall job satisfaction scale was used. Similar outcomes are demonstrated when relationships between student attitude to the science class and teacher reports on specific job characteristics were analysed.

Preliminary modelling (Table A16.63; Appendix 16) show no significant relationships to occur between student attitude to class and teacher reports on their job attributes in Biology. In Chemistry, however, relationships were found between attitude to class and the importance teachers place upon management and morale, the characteristics of their students and their work content. The valuation of work content was also of relevance in the Physics classroom (Table 9.07).

Table 9.07: Relationships between teacher reward/value scales and student attitude to class

Independent variable	Dependent variable	Significance	Direction of relationship	Method of analysis
Physics				
Work content (value)	Attitude to class	*	+	CUA
Chemistry				
Management and morale (value)	Attitude to class	*	-	MLM
Student characteristics (value)		*	-	MLM
Work content (value)		*	-	CUA

Overall it would appear that the *value* systems teachers hold concerning the attributes of their jobs are associated with the attitudes to the class (in Physics and Chemistry), whereas their actual perceptions of these attributes (*rewards*) make no contribution. This may show it is the nature of the teacher that is important in this instance rather than the situation in which she finds herself. It has further been shown (Poppleton & Riseborough, 1990b) that work centrality in teachers is also value driven. This leads to speculation that perhaps this construct might be worthy of consideration in future research in favour of the overall job satisfaction scale that has been found to be more reward driven (Chapter 7 and Poppleton, 1989).

The majority of relationships were negative indicating that, as the management and morale, characteristics of students and work content job characteristics became more valued, the worse becomes the student attitude to the Chemistry class. It could be conjectured again, therefore, that if these job attributes are well (or perhaps overly) valued, teachers are likely to be more open to disappointment than if these characteristics were not of such importance. This disillusion may be especially likely if teachers have been unwilling to compromise some of their higher value systems that do not fit in with the teaching reality.

Job characteristics both within (work content and student characteristic scales) and outside of student sphere (management and morale scale) are significantly associated with students' attitude to class. This adds further support to the argument that teachers may import external issues into the classroom when they interact with the student.

The majority of the relationships were found in the Chemistry sample, which suggests that Chemistry teachers are in a context or teaching culture in which management and morale and student characteristics job attributes are of greater relevance than in the other two subjects. The valuation of work content, however, was related to both attitudes to Chemistry and Physics classes indicating that such values held by teachers might be more universal in their effect and not constrained to the Chemistry. Associations were also significant only in the CUA analyses so conclusions can be drawn at the level of the class alone, i.e., the mean attitude of the class as a whole to Chemistry and Physics is related to the value these subject teachers place upon their work content.

The direction of the relationships were distinct between Chemistry and Physics, however, and lead to concerns firstly on the size of the sample that might be falsely distorting the direction of the relationship, the actual relevance of the finding or the linear nature of the relationship. The difference could of course be cultural. In Physics classrooms high valuations of work content does not lead to teachers being disappointed with their work and may demonstrate that Physics teachers receive greater stimulation from their work than do Chemistry teachers. A lack of distinction, however, between subject teachers on work content reward scales (Table 6.34; Chapter 6) does not support these thoughts.

Considering the reverse relationship, the attitudes of students may also affect the value systems teachers themselves hold. This would seem to be specifically true in the association measured between the value placed upon student characteristics and student attitudes to the class, i.e., the teacher exposed to good student attitudes to his subject may begin to value the characteristics more than if student attitudes had been poorer.

9.2.8.2.Student attitudes towards the science teacher

When considering the relationships found between the job attribute scales and attitudes to the teacher, one finds that as with attitudes to the class/subject, values predominate although rewards are also relevant.

The work content (reward and value) scale was of consequence (Table 9.08) in Chemistry as it had been in the attitude to class analyses (Section 9.2.8.1). In Physics, however, distinct scales became of interest, namely the valuations of community-school

relations, the responsibility for student progress and the reward scale for workload (Table 9.08). Where relationships with Biology had not been forthcoming in the analyses of the attitude to the class, reward dimensions of the material rewards scale now appeared relevant, in addition to the value scale of personal and professional development (Table 9.08).

Table 9.08: Relationships between teacher reward/value scales and student attitude to teacher

Independent variable	Dependent variable	Significance	Direction of relationship	Method of analysis
Physics				
Responsibility for student progress (value)	Attitude to teacher	*	-	MLM
Relationships between the community and school (value)		**	-	CUA
Workload (value)		*	+	CUA
Biology				
Material rewards (reward)	Attitude to teacher	***/**	+/+	MLM/CUA
Personal and professional development (value)		**/**	+/+	MLM/CUA
Chemistry				
Work content (reward)	Attitude to teacher	*/*	-	MLM/CUA
Work content (value)		**/***	-	MLM/CUA

9.2.8.2.1. Chemistry

The work content scale has appeared in Chemistry analyses consistently (Sections 9.2.7 and 9.2.8.1), and questions arise as to why this scale specifically is relevant in the Chemistry teacher-student interaction. As previously described, greater valuations of work content may lead to teacher disappointment in the actual stimulation provided, feelings that could be reflected in their teaching practice and influence the attitude of the students to the teachers themselves as well as the subject they are teaching. In other words, it is related to both the students' enjoyment of the subject and the relationships they form with the teacher.

The consistency of appearance of the work content scale generates several questions: Are Chemistry teachers more susceptible to frustrations even if they value this component no more or less than other subject teachers? Are they less accepting of the levels of stimulation that teaching as a profession can offer? Could this be related to alternative career aspirations they may have harboured before entering the profession? Are Biology and Physics teachers more satisfied because teachers of these subjects have fewer career options available to them? Substantiation of these questions is beyond the

scope of this study but points to the usefulness of this exploratory research in the creation and direction of future avenues of investigation. In doing so, it should be remembered that it is the *relationships* between student perceptions, attitudes and teacher satisfaction scales that keep arising and that actual differences between teacher attitudes to their work content do not differ between subjects (Table 6.34; Chapter 6).

Student attitude to teacher was also negatively associated with the work content *reward* scale in Chemistry. The negative relationship, as explained in section 9.2.7, is hard to explain as this result would indicate that the greater the stimulation received by the teacher the less likely are students to have a good attitude towards them. It is worth reiterating that a quadratic (or other non-linear) relationship needs to be investigated here and in perhaps all the relationships analysed in this chapter.

9.2.8.2.2. Biology

In Biology, the positive association between a teacher's feelings of the adequacy of material rewards and student attitude to the teacher, shows that concerns with economic and related difficulties may well influence teacher mood, motivation, patience and eventually her relationship with the student. This result is in confirmation of previous results (Section 9.2.7) showing a relation between Biology teachers' perceptions of their material rewards and the perceptions students hold of the teacher's satisfaction. This may reflect, however, the moderate connection that has already been established between the scales of student perceptions and their attitudes to the teacher (Section 9.2.4).

It was demonstrated also that the more importance placed upon personal and professional development by the Biology teacher, the better the attitude of the students to that teacher (and vice versa). This scale had not arisen previously in analysis and the valuation of this job characteristic may identify teachers with ambition and interest in improving themselves both as individual people and as teachers. These teachers may be better liked by their students because of their interest in their jobs. Teachers indifferent to such development may be unwilling to improve upon their practice and be uninterested in their occupation, perhaps even in the students themselves, a fact of which students may be aware. Studies involving work centrality may shed light on these relationships.

9.2.8.2.3. Physics

Unsurprisingly, Physics teachers who consider their workload to be reasonable are more likely to have students who have positive attitudes towards them. Pressures imposed by an excessive workload, the result of large class numbers or working in a number of different schools, for example, are very likely to influence the teacher behaviour in the classroom and the relationship between teacher and student.

Physics teachers who place greater importance upon community-school relations are less likely to teach students whose attitudes to the teacher are reported as favourable. Teachers who report these job attributes as being important may be reacting to a situation in which they feel that conditions are not to their liking. They may perceive poor support from parents or a lack of respect from the community and such factors may make this job characteristic, and its importance, salient to them. Students who form part of a family or community that does not support its teachers, may develop poorer attitudes to their teachers in accordance with the attitudes and beliefs of significant others such as their parents. It was disappointing, based on this reasoning, however, that teachers' perceptions in the corresponding community-school relations reward scale, did not relate to student attitudes to their teacher.

A similar negative relationship was found between Physics teachers' valuations of the responsibilities they hold for student progress and student attitude to the teacher, i.e., teachers who see being involved in responsibilities related to the student's progress as important, are likely to have students who have poorer attitudes towards them. This is somewhat contrary to expectation, as one would imagine that teachers who hold such views would be more concerned with their students, a feature that would encourage respect and a positive response form their pupils. If a linear relationship is accepted, then teachers who feel it is important to participate in activities such as curriculum development, responsibilities for running of the department, counselling, etc., are teachers who are more prepared to move away from the classroom, and the students in it, and become involved in school management (management positions in Chile involved curricula development or pastoral guidance). These teachers may prefer the latter rather than direct everyday interaction with students, an attitude which students are aware of or, in fact, an attitude to which they actively contribute.

In a general review of the results across subjects it is observed, once more, that teacher reports on job attributes that may be associated with student attitude, in this instance to the teacher, are not confined to those attributes within the environment of the student. The work content scales in Chemistry, the workload scale and perhaps the community school relations in Physics, match this definition but the remaining scales corresponding to responsibilities for student progress, personal and professional development and material rewards would appear to be outside this student domain. These issues may enter the realm of the student thought through his teacher and the feelings the teacher harbours towards these job components.

9.2.8.3.Student attitudes towards science as a career

All relationships that were formed between teacher attitudes to their job characteristics and the students' attitude to science as a career were detected within the analysis of the Chemistry sample. The linear associations (all negative) are with teachers' value reports, namely the importance placed upon material rewards, personal and professional development, relationships with colleagues and workload (Table 9.09).

Table 9.09: Relationships between teacher reward/value scales and student attitude to science as a career

Independent variable	Dependent variable	Significance	Direction of relationship	Method of analysis
Chemistry				
Material rewards (value)	Attitude to science as a career	*	-	MLM
Personal and professional development (value)		*	-	MLM
Relationships with colleagues (value)		*	-	MLM
Workload (value)		*	-	MLM

Student attitude to science as a career is covered in this research by a general scale about science, and is one which may fall equally under the influence of all three subject teachers. From the results shown (Table 9.09) it would seem that although this may theoretically be the case, it is the Chemistry teachers' reports alone that contribute to variance in student attitude to science as a future career. Although it was shown previously (Section 6.6; Chapter 6) that Chemistry teachers do not differ from their colleagues in their valuations or perceived rewards, it would seem that their values may be transferred more strongly to their students. This does not mean that other teachers

are not influential in other ways but that their possible influence is not through the value systems they hold with regard to their work situation.

Generally, students may see their teachers as a role model or significant other when compiling information (beliefs) and developing attitudes about what employment they would like to follow. Teacher behaviour in the class as influenced by feelings towards her job may cause students to form not only an impression about the subject itself and the teacher but also what it must be like to be a scientist. If science teachers appear unhappy, then students may be less inclined to follow such a career. Such unhappiness may result from the placement of high importance upon certain job characteristics that in reality are scarce, causing, as previously noted, frustration in teachers, which they display within the classroom. It is difficult to determine why values placed upon specific scales might influence student attitude to science as a career and why this only takes place within the Chemistry environment.

It is assumed here that students actually view their teachers more as scientists than teachers and that they in fact use teachers as role models for the former and not the latter. There is also the reminder that the attitude to science as a career is considered the attitude variable perhaps least under the influence of school and teacher (Section 9.2.4).

Statistically, the reverse relationship is possible, i.e., student attitude to science career has an influence upon the teachers' valuations of material rewards, personal and professional development, relationships with colleagues and workload. Logically the effect of the teacher upon the students in this instance would seem more viable, as little reason can be thought of as why students' attitude to a career might influence teachers' valuations of their material rewards, or professional development, for example, other than it might make teachers feel that they had encouraged and motivated their students sufficiently to engender a liking of science.

9.2.9. Hypothesis 9: Teacher reports of job characteristic rewards and/or values are associated with student achievement.

In this final hypothesis, further support is given to the conclusion that teachers' valuations and perceptions of reward, if compared to the overall job satisfaction scale, are a more lucrative area of study in forging links between teacher attitude and student achievement measures.

9.2.9.1.Independent test scores

Four of the five relationships found between independent test scores and teacher scales (management and morale, material rewards, physical working conditions and student characteristics) lay within the Physics analysis with only one association (with the valuation of career advancement) being found within that of Biology (Table 9.10).

Table 9.10: Relationships between teacher reward/value scales and student achievement

Independent variable	Dependent variable	Significance	Direction of relationship	Method of analysis
Physics				
Management and morale (reward)	Independent test score	**	+	MLM
Material rewards (reward)	Independent test score	***/*	+/+	MLM/CUA
Physical working conditions (reward)	Independent test score	**/**	+/+	MLM/CUA
Student characteristics (reward)	Independent test score	**	+	MLM
Career advancement (reward)	Term marks	**/*	+/+	MLM/CUA
Management and morale (reward)	Term marks	*	+	MLM
Relationships with colleagues (reward)	Term marks	*/*	+/+	MLM/CUA
Relationships with colleagues (value)	Term marks	*/*	+/+	MLM/CUA
Biology				
Career advancement (value)	Independent test score	**	-	MLM
Chemistry				
Work content (reward)	Term marks	***/***	-/-	MLM/CUA
Work content (value)	Term marks	**/*	-/-	MLM/CUA

One must take into account, when considering the possible impact of the perception teachers hold, that teachers might make accurate measures of certain characteristics and that these conditions might physically affect students' progress, independent of the teacher themselves. However, in defence of an argument that seeks to implicate teacher sentiments in student learning, there are scales where a direct link of the job characteristic to the student, other than through the attitude and behaviour of the teacher, would seem unlikely. Teachers' perceptions of the adequacy of material

rewards and the opportunities for career advancement are such scales, job facets closely interwoven with the teacher himself.

For most of the scales the issue could be debated either way. The physical working conditions in which teachers give instruction, for example, are much the same as that in which the student will learn. The presence (or lack) of laboratory and computer facilities, material provision or ambience of the learning environment, may themselves be factors inhibiting (or enhancing) student learning. These conditions may still have an indirect effect on student achievement, however, through teacher attitudes, as teachers may be motivated, or not as the case may be, by the conditions in which they teach.

Furthermore, student characteristics may be challenging in themselves, i.e., high absenteeism and responsiveness in class are likely to effect their achievement eventually. However, one need only consider the literature on teacher expectations, often related to the socio-economic status of the student (e.g., Flip *et al.*, 1982; Dusek & Joseph, 1983; Pizarro Ruiz; 1986; Arancibia & Maltes, 1989; Gysling, 1992b; Arancibia & Alvarez, 1994), to argue that the perceptions teachers have of their students' characteristics are also important.

Likewise relationships with management, good staff morale and satisfaction therewith may make the teacher more content and more approachable in general, in and outside the classroom. Good management may lead also to better practice by teachers in the classroom and, hence, affect student achievement in this way.

It has become obvious from this research that teachers will have to be questioned in greater depth as to the emotional and behavioural reactions stimulated by their perceptions (and associated values) of the significant job characteristics. These stimuli may be compared and contrasted with independent measures of the 'reality' of job characteristics in the school, so as to make the general picture clearer.

9.2.9.2.Term marks

As with independent test scores, term marks showed a tendency to be related mainly to Physics teacher scales, specifically the career advancement, management and morale and relationships with colleagues job characteristics. A relationship with the work content scale was calculated in Chemistry (Table 9.10).

The predominance of relationships within the Physics analysis in both forms of achievement was a partial reflection of the finding in the analysis of the relationships between teacher overall job satisfaction and Physics achievement scores (Section 9.2.6) that demonstrated links between Physics term marks and teacher overall job satisfaction. It may be suggested again, therefore, that the manner in which Physics achievement is influenced by teacher attitudes may be distinct, be mediated by alternate unmeasured factors and/or be more direct than in Biology and Chemistry. It also points to the fact that Biology and Chemistry teachers may have more in common with each other than they do with Physics teachers.

The characteristic of relationships with colleagues is an interesting one, the value scale only having appeared once before in an analysis of relationships between teacher attitudes and the student attitude to science as a career (Section 9.2.8.3). In Physics, it appeared that the more teachers valued their relationships with colleagues the more likely were their students to achieve well. Perhaps teachers who seek collegial interaction and support, because they see it as important, are better teachers as a result. The significant result for the relationships with colleagues (reward) scale would confirm this, i.e., those that value collegial interaction in fact receive and benefit from it as teachers. A significant correlation of 0.5** (Table 7.05, Chapter 7) between the value and reward variable supports this notion.

Once again an association has been detected between student variables in Chemistry (in this case term marks) and the teacher scale of work content. The possibility that Chemistry teachers, as a group, have some issue with this dimension of their profession, may be, therefore, repeated. The fact that independent scores are not affected indicates that this sentiment amongst these teachers may influence the manner in which they mark, rather than student achievement itself.

If one compares the associations of teacher scales with term marks on the one hand, with relationships between teacher scales and student independent test scores on the other, one finds only one common relationship between them, namely the relationships between both measures of Physics achievement and the management and morale (reward) scale. Other scales, different to those related to independent achievement, appear to be relevant in the term mark measure of achievement. So, where teacher

perceptions of management and morale may influence student achievement itself, the remaining teacher scales, related to term marks, may influence *how* the teacher allocates her marks. One makes the assumption in this theorising that term marks are open to greater subjectivity on the part of the teacher, and affected by factors other than student achievement alone.

To expand the discussion on teacher subjectivity, Chemistry independent test scores were unassociated with any teacher scales, but work content reward and value scales were found to be related to term marks. The reverse appears to be the case in Biology where no scales are related to term marks and only one relationship is found in the analysis of the independent test scores. This could mean that Chemistry teachers are more prone to be less objective in their grading. None of their attitudes influence an independent score of achievement but term marks are affected. Biology teachers on the other hand, where none of the measured teacher attitudes are of significance, may in this respect be more objective markers. Independent Biology scores and the term marks show the strongest correlation, which would favour this theory (Table 6.27; Chapter 6).

A summary of all the relationships between the different teacher attitudes and student attitudes, perceptions and achievement measures are summarised in Figures 9.02 and 9.03. The direction of the relationships is also displayed.

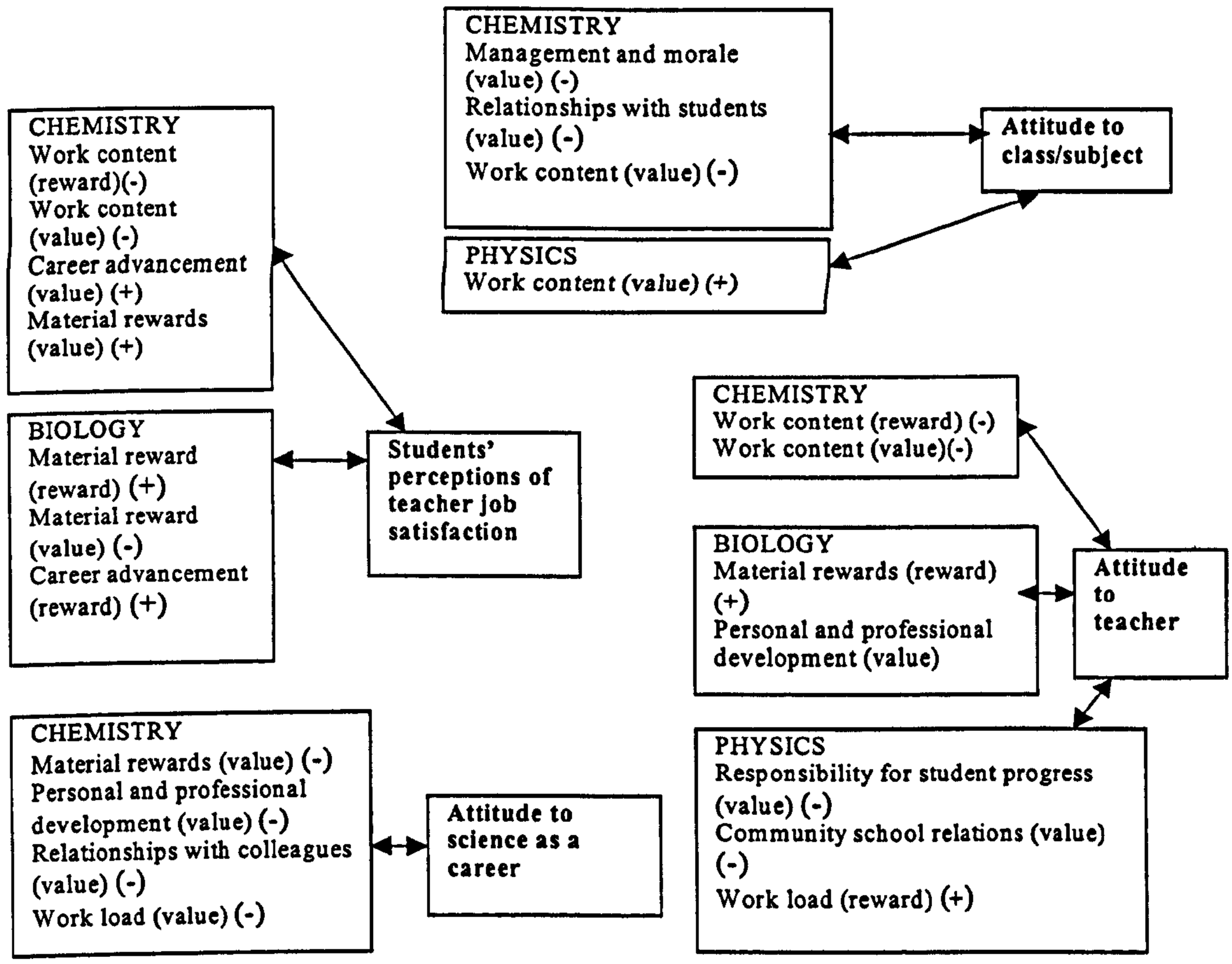


Figure 9.02: Summary of relationships between student attitudes and perceptions with and teacher reward and value scales

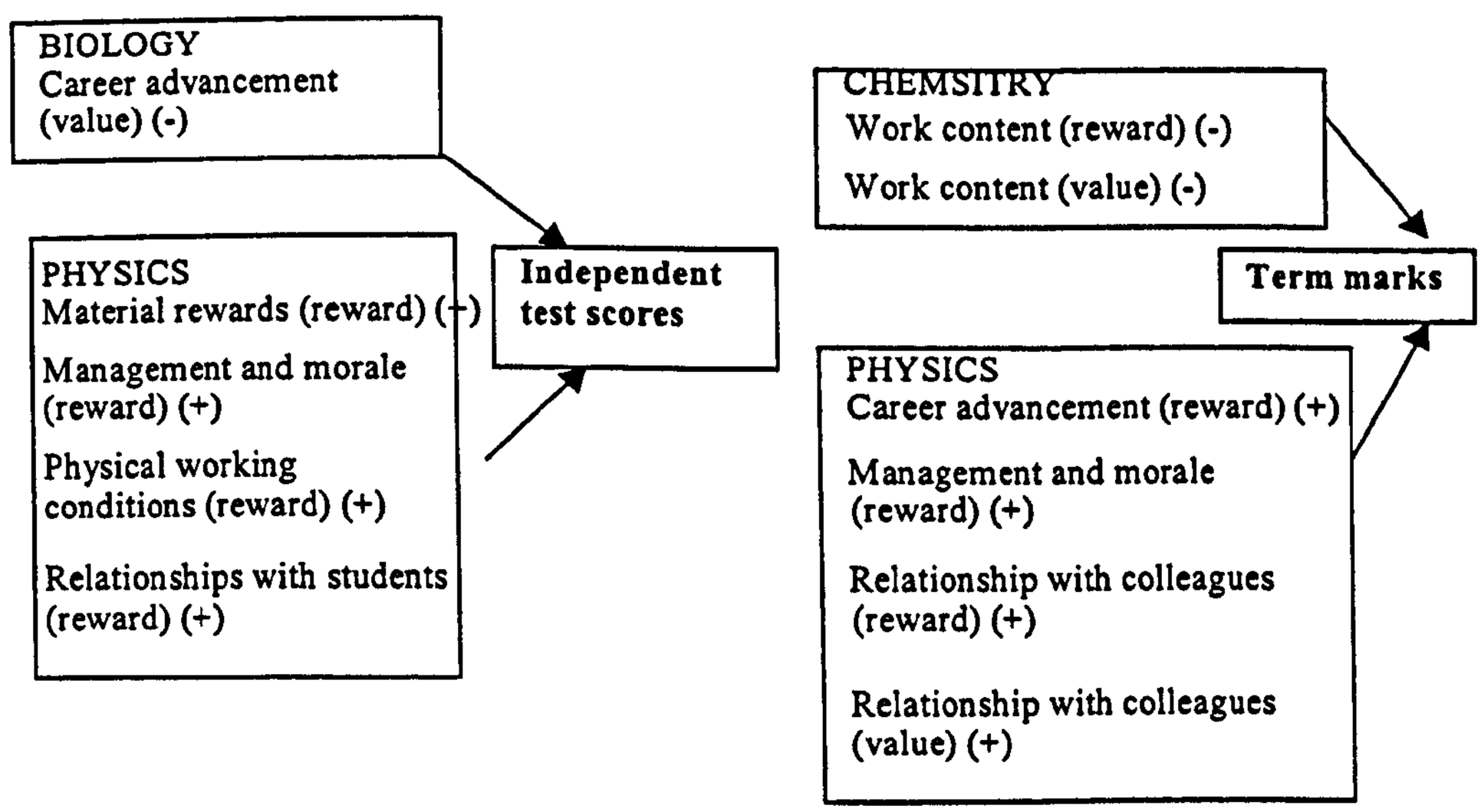


Figure 9.03: Summary of relationships between student achievement and teacher reward/value scales

It can be concluded from these summaries (Figures 9.02 and 9.03) that there are a substantial number of relationships evident between teacher value and reward scales and student perceptions, as well as between these scales and student attitudes, in support of hypotheses that aimed to associate teacher reports of satisfaction and student outcomes. Associations with the attitude to the teacher scale are particularly abundant, marking this as one of the student outcomes perhaps most under the influence of teacher satisfaction. That student attitude to the teacher may be one of the more direct reflections of the student-teacher interaction, makes this observation more defensible.

Relationships between teacher reward/value scales have also been established in favour of hypotheses that associate teacher satisfaction with student achievement.

A lack in consistency in the value and reward scales of significance (Figures 9.01 and 9.02), makes it difficult to establish which job components might be more relevant than others. A simple frequency count of significant relationships summarised in these diagrams indicates that most relationships are found for the work content scale, followed by the material rewards and then the career advancement scale. That these are three of the job attributes of greatest import to overall teacher job satisfaction (Chapter 7) supports an argument that proposes that these job characteristics, of particular importance to the teacher, both external and internal to the classroom environment, infiltrate teacher teaching practice and affect the students therein.

In general, value variables tend to be negatively associated with student outcomes which points to the fact that teachers who value certain attributes highly are likely to undergo disappointment with characteristics in the teaching context and display these feeling to students. The relevance of specific values over others (e.g., the occurrence of career advancement or material rewards, in contrast to lack of relevance administrative responsibility) may reflect deficits in particular job attributes that make certain characteristics more salient, and valued, in their absence.

The majority of teacher reward variables are positively related to student outcomes indicating that as these attributes are seen as more and more adequate, teacher attitude and behaviour reflect their improved contentment which may have an influence upon student outcomes. This trend is not entirely consistent and higher order, non-linear modelling must be conducted before such relationships are discussed further.

When comparing the *proportion* of rewards to values that relate to student achievement on the one hand and student perceptions and attitudes on the other, values were more likely to be of influence in the latter outcomes, rewards of more influence in the achievement outcomes. It may be, as teacher reward reports are likely to have a component of reality in them with regard to the teaching situation, that students' achievement is associated not only with the teachers' perceptions but the reality of the situation itself. In contrast, student perceptions and attitudes, being more affective in origin, are more under the influence of factors that involve the relationship with their teacher than the physical realities of the classroom and school. Teacher values that, unlike reward scales, may have a lesser practical reality factor associated with them, now come into play. Value systems may also be more a reflection of the teachers' personality (although the environment may make certain values more salient than others), a factor that will relate to the relationship, attitudes and beliefs a student holds towards that particular teacher.

The prevalence of value scales in the relationships found with student attitudes further suggests that values are of importance in this research and at this stage of investigation, abandonment of values, as has been recommended by studies relating reward and value scales to teacher overall job satisfaction (Poppleton, 1989), is not yet an option. Poppleton (1989) may still be correct in assuming that values are intrinsic to the reward measurement but future research where reward and value variables are regressed simultaneously onto student outcome variables would need to be conducted before such decisions could be made. At this point, values are worthy of further consideration especially in their associations with student attitudes and perceptions.

Considerations remain as to whether the division of satisfaction into reward and value components may be only appropriate for studies aiming to determine the predictors of overall job satisfaction rather than those investigating the relationship between satisfaction and student variables. In this research the use of a scale measuring satisfaction as a whole construct, but specifically for each job characteristic, may be a more fruitful avenue of investigation. However, on observing the lack of relationship between the overall job satisfaction scale and student outcomes, alongside criticisms made by Evans (1997) on the dual interpretations of the term "satisfaction" (Section 2.6.1; Chapter 2), due caution is advised.

Further comment on the summaries presented (Figures 9.02 and 9.03) may be made if a comparison is made between subjects. The teacher scales that influence student achievement in Physics are entirely different from those that are associated with student perceptions and attitudes (when these actually occurred). This is further support for the suggestion that the relationships between teacher overall and specific job satisfactions and final achievement is mediated by factors distinct to the other two sciences. Where there would seem to be the possibility in Biology and Chemistry that attitudes and perceptions do translate teacher attitude into student achievement, in Physics the route seems to be distinct, and this points to the involvement of other mediators. Although at this exploratory stage of research into this area no firm pattern can be defined unequivocally, what is shown here is that classroom cultures are distinct and need be considered separately in future study.

Previous employment of the instrument used in this research (e.g., Poppleton, 1989; Menlo & Poppleton, 1990) divides the scales they use in the measurement of job satisfaction into those related to working conditions, roles and responsibilities and classroom practice. The vast majority of the scales that influence student outcomes in the present research are involved with working conditions (classroom practice was not included), roles and responsibilities being only relevant in two instances. This would suggest, therefore, that future research would be justified on concentrating on the working conditions scales.

9.3. Analysis of why students think their teachers are satisfied

It has been established that relationships may exist between teacher attitudes and student outcomes and some reasons have been presented as to why this may be occurring. Most of them hinge on the possibility that an expression of teacher satisfaction in the classroom may cause students to form beliefs about their teachers' levels of satisfaction, which in turn influences their attitudes and achievement in science. To investigate these beliefs in greater depth, students were asked directly, in open-ended formatting, if they felt their teacher to be satisfied and to explain why they thought this to be so.

Between 10 and 11 % of the student sample from each school was selected for analysis (70 students in total), 21 students being from Coquimbo and 49 from La Serena, 31 female, 39 male; 43 from subsidised schools and 27 attending municipal establishments.

The majority of students replied in the *affirmative when asked if their teacher was* satisfied, the highest percentage being shown in Biology (91% believed their teacher to be satisfied). The smallest percentage of students felt their Physics teachers were satisfied (80%), with similar figures being calculated for Chemistry (83%). These observations are in agreement with suggestions made in Chapter 8 where it was proposed that Biology teachers may have a better teaching experience.

The highly positive response by students to this question in general may signify that teachers are in general satisfied, or that students misinterpret what they see in the classroom as satisfaction. Moderate levels of overall satisfaction in teachers (Appendix 13) show that in general terms students may be partially correct in their judgements.

Separate questions had been used in the questionnaire for each subject area but as much repetition in the responses the students gave for each subject teacher was observed, answers to the question were merged across disciplines. The description of the categories created from these responses is presented in Table 9.11.

Table 9.11: Student categories describing reasons for thinking teachers were satisfied/dissatisfied

Category number and name		Description
Category 1: Teacher choice		**The teacher chose this career or chooses to remain therein and, therefore, must be happy. S/he otherwise would have chosen another career or have changed jobs, e.g.:** Yes she is satisfied, as if she didn't like her work she would not be giving us classes and would have withdrawn from her job a long time ago; Yes, I think she is (satisfied) because she chose this career and I think that she is satisfied doing what she enjoys.
Category 2: General teacher behaviour in class	**Category 2a: Classroom practice**	**Students believe that the teacher is or is not satisfied based on how good a teacher they are or from the style of the class e.g.** Yes (the teacher is satisfied) if she was not satisfied she would not teach so well....; Yes, because the classes are very ordered and the students behave well and he can do his class calmly; No, because at times he arrives in the classroom, delivers ...30 minutes of material and explanation and after he leaves with the class books and leaves us free for the rest of the class; Yes, because her classes are very entertaining and the way she teaches makes one think she likes her work a lot
	Category 2b: Concern teacher shows in the class	**Mentions that teacher takes time to explain, is prepared to help and shows concern, e.g.** Yes, because when teaching us and when we don't understand, she always explains again in a much easier way. Yes, personally I think that my teacher is very satisfied with her performance at work because....for those that do not understand she is disposed to explain to them. Yes, because she wants that we understand and worries when we don't understand or get bad marks
Category 3: Teacher expectation		**Teacher has high expectations for the student, e.g., yes,** because she is very motivated in the way she teaches and motivates us to learn and understand her and always expects more of us; No, because she expects more of us;
Category 4: Inferences from student behaviour or outcome		**Students believe that teacher satisfaction has derived from the presence of some form of student outcome e.g.,** Yes, because if the students do well she should be satisfied because this means she is teaching well ; No, (the teacher is not satisfied) because in this school we as pupils do not behave as we should (we don't pay attention). This is because the classes are not very dynamic.
Category 5: Teacher motivation		**The teacher is satisfied because she shows herself to be motivated, with a good desire to teach or to demonstrate interest in teaching, e.g.,** Yes, she is very motivated in the way she teaches and motivates us to learn and understand.

Table 9.11 (Continued)

Category 6: Teacher mood	**The teacher shows her satisfaction in some sort of external attitude or mood display such as being happy or animated e.g.,** Yes, because I have never seen her despondent when perhaps there existed occasions to be so; No, because he always is angry when he teaches and has no sense of humour
Category 7: Teacher shows interest in subject area	**Teacher shows an interest in his subject in particular, e.g.** Yes, because she shows often in classes that she loves Chemistry and is so enthusiastic/animated that she transmits to us the desire to study this subject
Category 8: Teacher demonstrates liking of teaching	**Teacher is thought to be satisfied because student believes she enjoys teaching, e.g.,** Yes, because she enjoys giving classes and explaining to us; Yes, she loves her job and I think she wants us to pick up the liking thereof
Category 9: Direct complaint	**Teacher has or has not complained, e.g.** No, because she complains about her environment which much of the time does permit her to do classes, apart from just speaking; No, because he talks of the lack of material
Category 10: Would be trying harder	**If teacher was not satisfied, he would try and work harder to be a better teacher, e.g.** yes, because if she was not satisfied with her work she would have sacrificed more to improve her teaching; Yes, because if she was not satisfied I think she would have tried to know more to be a better teacher;
Other	

The proportion of students mentioning each category can be viewed in Table 9.12.

Table 9.12: Distribution of satisfaction responses based on percentage of teachers mentioning this category

Category		***Total student sample reporting in each category (% of 70)***
Category 1: Teacher choice		29
Category 2: Classroom practice	**Category 2a: Style of class**	30
	Category 2b: Concern teacher shows in the class	23
	Total	46
Category 3:Teacher expectations		4
Category 4: Inferences from student behaviour or outcomes		27
Category 5:Teacher motivation		16
Category 6: Teacher mood		31
Category 7: Teacher shows interest in subject		10
Category 8: Teacher shows liking of teaching		23
Category 9: Direct complaint		4
Category 10: Would be trying harder		3
Other		16

The categories formed show that a large percentage of students base their answers on teacher practice within the classroom. Thirty percent of the sample believe that the way classes are managed and planned are indicators of teacher satisfaction, with interesting, dynamic, orderly classes being representative of this (Category 2a). Twenty three percent reported that high levels of concern showed by teachers for their students and their learning in the class, are also signs that the teacher is better satisfied (Category 2b). This category was partitioned off from the main classroom practice or style category, as it was seen as an indicator of direct student teacher-interaction to a greater extent than comments made on the nature of the class and its delivery. A high percentage of students responding in the classroom practice category in total (Category 2), may suggest that teacher behaviours, whether in the delivery of the class or in the relationships and care they show to students, reflect their attitudes to their work. It was sometimes difficult, however, to determine if students felt that teacher practices were a result of teacher satisfaction or a cause thereof. Teacher mood is also a common category that students provide as an indicator of how teachers might feel about their jobs (Category 6).

These latter responses on teacher practice as a sign of satisfaction may not be far wrong, as research on the relationships between teacher job satisfaction and teacher pro-social and antisocial behavioural altering techniques used in classroom management has

shown (Plax *et al.*, 1986). Teachers that employed antisocial techniques, e.g., emphasis on the legitimacy of higher authority, teacher authority and punishment for poor behaviour, showed lower satisfaction with teaching and students. This was in contrast to the higher satisfaction felt by teachers who used pro-social controls such as the rewarding of positive behaviours and methods that built student esteem. There is the possibility that teachers attempt pro-social techniques initially but, finding them ineffective in dealing with particular students or classes, change to antisocial ones out of frustration, a situation that adversely affects their satisfaction since antisocial methods are likely to be as stressful to the individual that uses them as to the students that receive them. Plax *et al.* (1986) does allow that teachers who are less satisfied to begin with may use anti-social techniques more frequently to control their classrooms, based on a predisposition of these teachers to view teaching as unrewarding and the students as unteachable.

Teachers do not appear to be talking directly to students about their feelings of contentment, or otherwise, as only 4% of the sample mention that teachers have made a direct complaint of the conditions under which they work (Category 9). If teacher work attitudes are transferred to the student then it must be achieved through the students' observations of that teacher's expression of her attitude through mood, practice or interaction with the students rather than through direct conversation with the teacher on this topic.

Some students chose to make direct conjecture as to why their teacher was or was not satisfied. This is illustrated in their responses in terms of classroom practice or teacher mood. Others make more indirect responses, generated through inference. For example, 29% believe that teachers *must* be satisfied, otherwise they would not be in teaching to begin with or would have left the profession (Category 1). These responses are more deductive in nature and less influenced by the student-teacher interaction. Other inferences are similarly deductive although more egocentric in nature, e.g., 'we behave badly so she must be unhappy' or 'our achievement is good so she must be satisfied' (27%) (Category 4).

In an attempt to extract further information from the data at hand, categories were partitioned between a range of background characteristics with the intention that such an analysis might shed some light on the transfer of teacher attitude to the student. Such

analyses were based on groupings according to student gender, parental education, school location, school fee, school administration, income per student family member and student ability.

No relationships are worth mentioning from the student ability, income per student family member and mother's education analyses and are not presented here. A full report of both significant and significant results may be found in Appendix 17. The relationships either of significance or near significance, and thought worthy of observation, in the analyses of school administration and location are reported in Table 9.13.

Table 9.13: Distribution of student responses based on school administration and location.

	Grouping	**School administration**			**Location of school**		
Category		***Municipal School (% of 27)***	***Private Subsidised School (% of 43)***	***χ^2 statistic (d.f.=1)***	***La Serena (% of 49)***	***Coquimbo (% of 21)***	***χ^2 statistic (d.f.=1)***
Category 1: Teacher choice		41	21	3.2	20	48	5.3*
Category 2: Classroom practice	**Category 2a: Style of class**	37	26	1.0	37	14	3.5
	Category 2b: Concern teacher shows in the class	22	23	0.0	29	10	3.0
Total		48	44	0.1	51	33	1.9
Category 4: Inferences from student behaviour or outcomes		15	35	3.4	31	19	1.0

Students from Coquimbo appeared significantly more likely to infer their teachers' satisfaction from the fact that teachers had chosen the profession or remained within it. Similarly students in municipal schools were more likely than their private subsidised peers to make such comment. This category appears to be impersonal in nature as students do not base their answers on any personal characteristic, practice or interaction between themselves and the teacher. Simply, the teacher would not be here if she was dissatisfied. It has been suggested in previous chapters that municipal schools and those in the region of Coquimbo may be poorly resourced with inferior infrastructure and

attracting students of lower socio-economic status. Perhaps these situations are not conducive to the formation of close relationships between student and teacher and hence the rather cooler replies to the questioning.

In contrast students in La Serena were more likely (although not significantly so) to make direct responses related to the style and form of the classes delivered and the concern the teacher showed towards the students. It is also more probable that students from private subsidised schools believed their own achievement or behaviour to be the reason for teachers' state of well being. These questions are more involved with the teacher themselves and the interaction in the classroom and, hence, these responses support the arguments made above.

Further divisions of the sample was achieved by father's education, student gender and school fee. (Table 9.14).

Table 9.14: Distribution of student responses based on father's education and school fee.

	Grouping	*Father's education*				*School fee*			
Category		*Group 1*	*Group 2*	*Group 3*	*χ^2 statistic (d.f.=2)*	*Group 1 (% of 19)*	*Group 2 (% of 21)*	*Group 3 (% of 30)*	*χ^2 statistic (d.f.=2)*
Category 2: Classroom practice	**Category 2a: Style of class**	15	26	58	6.4*	47	43	20	0.1
	Category 2b: Concern teacher shows in the class	5	26	25	3.6	32	19	20	1.9
Total		30	4	7	4.4	53	43	20	1.1
Category 4: Inferences from student behaviour or outcomes		25	42	25	1.6	42	33	13	5.5

Students from lower socio-economic status backgrounds, as judged by the father's education, tended to explain satisfaction of their teacher in terms of the style in which the teacher conducted the class (Category 2a). This would seem in contradiction to the above discussion that lower socio-economic status students might have give less personalised reasons for their teacher's satisfaction. However, the level of the father's education is a measure of socio-economic status external to the school. Therefore, the less personal replies made by students in municipal schools in Coquimbo may have

more to do with the location and administration of the school and the atmosphere this creates, than the socio-economic status of the student as such.

Students in higher fee paying (and hence socio-economic status) schools showed a tendency to comment more on the association between student behaviour and outcomes on the one hand and teacher satisfaction on the other (Category 4). As the administration of these schools is likely to be privately subsidised, it may follow that students in these schools are more aware of the influence they and their parents have over the teachers. In fact those who pay the highest fees appear even more conscious of this than are the middle fee-paying group. Whether this knowledge actually leads students to behave poorly in class or to be aware that the teacher is more under their influence, is a question for future research.

Only one result was worthy of mention in the analysis by student gender (Table 9.15).

Table 9.15: Distribution of student responses based on student gender

	Grouping	*Gender*		
Category		*Male (% of 39)*	*Female (% of 31)*	*χ^2 statistic (d.f.=1)*
Category 9: Teacher shows interest in subject		3	19	5.4*

Significantly more female students felt that the teacher was satisfied because of their (the teacher's) interest in the subject they are teaching. Why this gender disparity occurs is hard to define at this stage of research. It may simply reflect a reality that relationships between female students and teachers are more favourable, as has been alluded to in previous chapters where it was shown that female students demonstrated more favourable attitudes to Biology classes and Chemistry teachers, and tended to be awarded higher term marks (Sections 6.2.8 and 6.4.7; Chapter 6).

The reasons which students provided for believing their teachers to be satisfied or not, were not as rich in explanatory power, with respect to how teacher satisfaction might translate to or be derived from student-teacher interaction, as was initially anticipated. In retrospect, the questioning format may be partially to blame. Firstly, there is a concern that the responses students make are reflections of their attitudes to the class and teacher rather than of their beliefs about the teacher's levels of satisfaction *per se* (associations between student belief and attitude scales described earlier in this

would support this). Secondly, also as described earlier, the directness of the question format may have been such as to encourage students to provide answers that they thought appropriate to the researcher collecting their reports. What exactly students saw as being appropriate is hard to say as some were exceedingly critical of the teachers being described. Thirdly, the direct line of questioning may tap more cognitive than affective replies, as to how the attitudinal transfers may be occurring (as the deductive responses of categories 1, 4 and 10 show). Future study may do well to employ less direct lines of questioning or to explore further why students provide the responses they do.

This chapter has sought to investigate the relationships between teacher job satisfaction and student outcomes. It was hypothesised that the teachers' feelings about their work is transferred to students through students perceptions of this satisfaction. These perceptions may influence students' own feelings towards various facets of science and finally their achievement. Some support for these hypotheses have been provided in the findings presented.

Analysis has shown also that use of the overall job satisfaction scale is inappropriate in this research, as associations failed to be uncovered between this scale and student attitudes and perceptions, with minimal relationships arising when direct analyses between teacher overall job satisfaction and achievement were conducted. Further research relating an overall scale, as it now stands, to the student outcomes of attitude and achievement, is not recommended.

Students' attitudes to their subject, teacher and science as a career are closely linked to student perceptions of teacher job satisfaction. The effect of one upon the other would seem equally probable, the definitive direction of the relationship not being investigated here. Both student attitudes and student perceptions are related to student achievement. Of these relationships it would appear that associations between attitude to the class and achievement are the most frequent or prevailing of those formed.

Investigation of teacher reports on specific job components was more lucrative than analysis of the general overall job satisfaction scale and links between these scales and student perceptions and attitudes were detected which might be subject specific. Teacher scales were also associated with student achievement measures although these

were somewhat distinct from those that had contributed to student attitude and perceptions, especially in the Physics analyses.

Recommendations have been made that scales representing teacher attitudes and valuations of career advancement, material rewards and work content be specifically noted by educational developers who seek to improve both teacher working lives and the performances of their students.

The findings presented in this chapter need to be positioned in relation to those discussed in previous chapters. This will be attempted in the following and final chapter. No study is without its limitations and this will be addressed alongside applications for the research and the manners in which it may be developed.

CHAPTER 10 CONCLUSION

This thesis has attempted to investigate the assumption that *a happier teacher is a better one*. In order to address this task, an image of the contextual background and sources of satisfaction in the Chilean teacher sample has been created, alongside an impression of the levels of student belief, attitude and achievement outcomes. These descriptions have produced the backdrop against which the main analysis of the relationships between teacher overall job satisfaction, and perceptions and valuations of their specific job attributes, and student outcomes was held.

10.1. Conclusions on background

Contextually the study took place in an environment in which inequalities in educational outcome are still evident. Students of lower socio-economic status backgrounds are associated with schools having a municipal administration and achievement is poorer in these environments. The location of the school and the ability of the student are also important factors associated with such discrepancies.

Attitudinal and perceptual differences amongst students in different administrations/ socio-economic status environments are also detected although these were not necessarily in favour of the higher socio-economic status student and varied across subject. Both attitudes and achievement are consistently lowest in Physics.

Teachers experience a range of working situations across the schools in which they work, with the number of schools in which they are employed, the working hours, socio-economic status, location and administration type of the school being intertwined. These conditions may alter levels of satisfaction to varying degrees but family income per member of the teacher's family, the gender and the age of the teacher are particularly related to the variance within teachers' job values. Similarly, teacher age, experience, gender and hours worked in a particular establishment are some of the variables more often related to teachers' actual perceptions of their work environment. Analysis of open-ended questions confirm the importance of considering gender and age in analyses of differences in the sources of satisfaction. Sources of dissatisfaction are more uniform in nature but school administration and location account for some of the little variation observed.

Management and morale, work content and student characteristics are job attributes that Chilean teachers perceive as particularly rewarding. The latter two attributes, work content and student characteristics, are intrinsic job components that are also highly valued although more extrinsic factors such as career advancement and material rewards are of importance too. Unfortunately, these extrinsic characteristics are viewed as particularly poor in the Chilean context as are opportunities for personal and professional development, general physical working conditions and opportunities for assuming administrative responsibilities. The lesser presence of the administrative responsibility reward, is of little concern, however, as teachers do not place much value upon this particular characteristic.

The high valuation and perception of work content would suggest that this would be a good source of satisfaction whereas the high valuation of career advancement and material rewards taken along side the low perceptions thereof, point to these being sources of dissatisfaction. This was indeed partially confirmed in regression analyses where relationships with colleagues, career advancement, work content, material rewards and physical working conditions were most prevalent in their prediction of overall job satisfaction.

Open ended questioning confirmed as well as broadened the knowledge held of the most relevant job attributes connected to overall job satisfaction, with teachers mentioning working with students, human relationships and the role as a developer as being the chief sources of satisfaction. Salary, the quantity of work, student characteristics, resources and infrastructure and provision of in-service training are examples of important sources of dissatisfaction.

The two factor theory (Herzberg *et al.,* 1959) was partially confirmed in the Chilean country and teaching professional context. This is so if the theory is interpreted in terms of the greatest percentage of factors causing job dissatisfaction in the sample being extrinsic and that the majority of reasons for satisfaction are intrinsic. Some characteristics may produce both sentiments.

Teachers look for the appreciation and affection of others, as the importance of relationships with colleagues, students, the community and management in the overall job satisfaction of the teacher would show. Teaching is a communication orientated

activity where conversational management skills are essential. Whether or not communication is achieved effectively impinges upon teacher satisfaction (Graham *et al.*, 1992). Bearing in mind the importance of the relationships with colleagues scale, for example, upon teacher overall job satisfaction and the high frequencies with which relationships are mentioned in the qualitative analysis, the importance of effective communication skills is not only important in relating to students, but in interactions also with management, parents and teaching colleagues in particular. It is, therefore, recommended that teacher training courses, both in-service and pre-service, include programmes that will develop teachers' skills in communication competence so that they are better able to interact. Such interaction will lead to the achievement of work related goals satisfying to all members party to the interaction. This may be of particular relevance in Science as scientists and science teachers are often thought of as the least articulate of all members of the academic disciplines.

Graham *et al.* (1992) show that the immediacy established between teachers and pupils, as defined as 'the physical and psychological state between interactants' was also related to teacher job satisfaction, reflecting a probability that a closer involvement with students will improve teachers' overall feelings of well being. These findings may also be related to the immediacy of communications between teachers and colleagues and other members of the school community. A greater closeness between fellow staff members would appear particularly important to Chilean teachers and team-building exercises aimed at reducing barriers to this might be desirable in improving Chilean teacher satisfaction.

If discussion of the importance of relationships with others for the Chilean teacher is extended into the academic realm, it might be recommended that future research include the theories of social exchange and the related themes of social capital, networks, cohesion and/or solidarity. Social capital, for example, may be defined as the benefits accruing to the individual or community as generated through various forms of social interaction. Coleman (1997) writes specifically of the benefit of this phenomenon to parents, the social networks between parents in private Catholic schools being the illustrative example. It might be interesting to investigate how social capital is developed, becomes owned by and is of benefit to *teachers*, as seen through the interactions and networks that are formed between peers in the same and distinct institutions. The gains derived from social capital generated through interchange between fellow teachers may be important to satisfaction and be augmented through

improving teacher solidarity, the formation of networks with which they are involved and encouraging trust amongst colleagues, students and parents. The advantages may be substantial, ranging from the pedagogic, such as team teaching and academic support, to emotional support and stress relief.

Although many of the factors, shown in this thesis to be related to teacher satisfaction, coincide with the difficulties, pleasures and value systems reported in teachers elsewhere in the literature, there is some disagreement with those that believe that teachers are not motivated by money (e.g., Alburquenque *et al.,* 1987). Results presented here show that extrinsic rewards are of importance also. This latter job attribute can be easily located historically in terms of the reduction in salaries under Pinochet and ongoing industrial disputes. The historical and social locations of levels of satisfaction with other attributes are harder to identify. Do teachers value relationships with colleagues highly because of the solidarity that colleagues may have offered in times of persecution under military rule? Does work content contribute to overall job satisfaction because teachers seek justification to remain in the profession when extrinsic attributes are found wanting (Salancik & Pfeffer, 1978)?

Finally, Bourdieu's thoughts on the acquisition of taste, might be extended to teachers' satisfaction. Bourdieu maintains that the members of the different classes 'develop a taste for what is available to them' (Williams, 1995). This could explain why teachers have learned to value or have developed satisfaction towards those attributes that are provided to them in an adequate form. These ideas will not be developed further here but an exploration of reasons behind teacher attitudes may shed much light on why they feel and act the way they do as influenced by the environment in which they work.

10.2. The relationship between student outcomes and teacher job satisfaction

The Fishbein-Ajzen model relating attitudes and beliefs to behaviour (Fishbein & Ajzen, 1975) was used as the basis for a framework to guide an exploration of the relationships between teacher satisfaction and student outcomes. Analysis has shown this model to be of some use although not equally so across the science disciplines studied.

The beliefs students hold about the satisfaction of their teachers were consistently associated across all subjects with the attitude students develop to the subject, the teacher and science as a career. It would be tempting to suggest, therefore, that these beliefs actually contribute to the development of attitude to science, a contribution weighted by the strength with which these beliefs are held. It must be considered, however, that if students do not have well formed beliefs about teacher satisfaction, then it is equally probable that students draw upon already well formed attitudes (in this case attitudes to the teacher and subject especially) to answer the question put to them. In this scenario, attitudes to the measured components of science are fulfilling an object appraisal function (Katz, 1960) where attitudes are employed by the individual to interpret what may be the novel prospect of the teacher as a person capable of satisfaction or dissatisfaction.

Following the sequence of the attitude model (Figure 2.01 Chapter 2), student attitudes to science are found in several instances to be related to their achievement. Once again it is tempting to propose that attitude is influential in contributing to the student behavioural patterns in such a way as to improve performance but, alternatively, good achievement may also improve students' attitude to the teacher, the subject and science as a future career as well.

Attitudes to the teacher were more exclusively related to term marks than independent measures of achievement, which suggests that the school grades awarded may in part be influenced by the relationship between the student and the teacher. It is conceivable that conversely the relationships between the student and teacher are influenced by the marks the students see the teacher as having given them.

In the analysis of term marks, issues relating to the subjectivity of these achievement measures have arisen. There was some indication that this subjectivity might be less in Biology teachers, although other indicators showed that Physics teachers might be more objective markers also. This led to the conclusion that Chemistry teachers are the most subjective in their allocation of semester grades and reasons for this, perhaps related to the student-teacher relationship, might be worth investigation in future research.

Student beliefs about teacher job satisfaction may bypass the attitudes to science and be directly related to student achievement. In the theory of reasoned action (Ajzen & Madden, 1986) individual students may hold certain beliefs about the actual behaviour

they are going to perform. Instead of student beliefs feeding into attitudes to science, therefore, student beliefs about their teacher's satisfaction may contribute to what they feel about their own behaviour to working well in science. If the science teacher is viewed as a significant other, then the beliefs about their satisfaction may be to some extent be normative, e.g., I don't think my teacher likes teaching so will she care if I work any harder?

In summary, therefore, this research has pointed to the possibility that students may hold beliefs about the satisfaction of their teacher that are related to student attitudes, which may in turn be associated with their achievement related behaviour in the classroom. Causality of one variable upon another cannot be proposed, however, until adequate path analyses or longitudinal studies are completed whereby the directions of relationships may be confirmed. Longitudinal work would be recommended in general to complement the cross sectional research described here. It has been stated that:

> "cross-sectional information on achievement is useful in providing a baseline from which to draw inferences..." (Goldstein ,1995; p27)

The formation of such a baseline has been the central objective of this study, which in light of the rarity of studies that empirically link job satisfaction to student outcomes, proves to be largely exploratory in nature. A limitation of any cross sectional study, however, is that it is difficult to trace the effect that an individual teacher might have had on an individual student. Despite indications that teachers had students for on average the full two-year period of the first cycle of secondary school, one can never be sure of the exact value added by these teachers. It would be essential, therefore, that in continuations of this research, longitudinal studies be undertaken whereby, prior attitude and achievement measures both of the teacher and the student be taken. This should be followed by post measurement in which the value added by the teacher to student attitude and achievement (and the value added by the student to teacher satisfaction) be calculated with some precision.

If student beliefs of teacher job satisfaction contribute to student attitudes and eventual performance, it needs to be asked what might be causing students to hold these beliefs. It has been shown in this research that these student beliefs are related to the perceptions and values teachers place upon components of their work environment. Teachers conceivably bring these values and perceptions into the classroom, and these may have

a direct effect on the development of students' belief systems concerning teacher satisfaction and an indirect effect on their attitudes and achievement.

When students are asked to give a free response to the question of why they feel their teacher is satisfied, they respond largely in terms of the practices, interactions and mood they see displayed in their teacher. In some cases teacher job satisfaction may not be obvious to them and they rely on their own powers of deduction to give answers, i.e., 'she must be happy if she remains in the job' or 'we behave so badly she must be very dissatisfied'.

Teacher reward and value variables may be influential not only via the path of the student beliefs about teacher job satisfaction, but also on students' attitudes to science and achievement directly. Relationships between teacher value and reward scales and student attitudes, especially those towards the teacher, support this suggestion. At this stage of understanding of the relationships under study, it must be considered that student attitudes, themselves part of the teachers' work environment, may contribute equally to the formation of teacher values and perceptions.

Although teacher value and reward scales in general are associated with student outcomes, relationships between specific job attributes and student outcomes were not as consistent as had been hoped. Despite this, characteristics repeated most often in their association with student outcomes were, in descending order of frequency, work content, material rewards and career advancement. These are the same job characteristics shown to be of significance to teacher overall feelings of well being (Chapter 7), the importance of material rewards being confirmed in more qualitative analyses (Chapter 8). This convergence in findings with respect to the career advancement, work content and material rewards job components, suggests that these scales are of prime importance to the teacher. Consequently, it can be argued that the salience of these issues in the teachers' lives become, in turn, issues in the classroom itself and, hence, impinge upon the students within it.

It was interesting, however, that the job component, relationships with colleagues, shown in regression analyses to have the strongest association with teacher overall job satisfaction did not seem of particular relevance to student outcome, only featuring as a factor in the allocation of term marks in Physics. This could mean that for some reason, perhaps related to their own professionality, most teachers can isolate this dimension

from the classroom. Alternatively, they might see relationships with colleagues as a problem associated with any profession and, hence, not allow it to affect their motivation to teaching specifically. Teachers may feel that job characteristics such as material rewards, career advancement and work content, however, are particularly problematic to teaching in Chile and allow these job attributes to fuel their levels of resentment, motivation and/or contentment, alter their classroom behaviour and thereby have an impact upon their students.

As student perceptions were associated with teacher value and reward scales of job attributes from within (work content) and outside of classroom environment (career advancement and material rewards), it is again suggested that when entering the classroom teachers are unable to rid themselves of concerns related to parts of the profession unrelated to teaching practice itself, and this is noticed by students. Similar results were seen in relationships shown to exist between student attitudes and teachers' valuations of job facets both within the classroom (e.g., work content and student characteristics), and outside of the classroom (e.g., management and morale).

Based on the findings that work content, career advancement and material rewards scales may be the job characteristics of most interest, recommendations to maximise these conditions within the context of Chile can be made with the justification not only of improving teacher job satisfaction but also that, through their effect upon the teacher, there is a likelihood that student outcomes will benefit.

First considering the work content scale, teaching as a profession should be one that is dynamic and offer the possibility of continual challenge beyond the first few years in which new teachers adjust to their jobs. Each year there is the novelty of a new student cohort, but there is the danger that subject knowledge and practice becomes stagnant and repetitive. This must be counteracted not only for the sake of the teacher as a professional but for the student whom it may indirectly affect. Improving the work content of the teacher could be achievable though attempts to stimulate teachers via diversifying their roles and through greater participation in decision making, for example. Creating more active and modern up-to-date curricula and running regular professional development courses (known to be wanting in many Chilean schools) that augment pedagogic and subject knowledge, would also achieve this end. Findings showing the consistency with which the work content scale was of relevance in

Chemistry analyses suggests that the improvement in the work content of Chemistry teachers may be a particular need.

Care should be taken not only with the intrinsic component of the teachers' life but with the extrinsic components, such as material rewards also. It may not be thought that teachers, as members of the service industry, are driven by the thoughts of financial gain but, if economic worries are allowed to distract teachers from their pedagogic obligations, then action needs to be taken by the ministry beyond that which is forced upon them by annual strike action.

Finally, teaching as a profession in general is unstaged (Lortie, 1975). In Chile the management positions available to teachers are few: the *profesor/a tecnico* in charge of issues related to the curriculum and timetabling) or the *profesor/a de orientación* (in charge of pastoral care), being two of the few possibilities. The creation of a larger number of postings so that teachers may follow a more structured career path, the assurance that such promotion would be fairly and transparently handled and other forms of recognition given for work well done, are some suggestions to improve both teacher satisfaction and student outcomes. Teacher awards are distributed in Chile but reach only the outstanding few and schemes are required that would allow access to recognition by the majority of the teaching workforce[14]. Such moves are not only likely to improve both the satisfaction of the teacher but also, through them, the outcomes of students.

10.3. Alternative approaches

Although some support has been made for the adaptations of the Fishbein-Ajzen model presented in Figures 4.01 and 4.02 (Chapter 4), and for student perceptions of teacher satisfaction and attitudes towards science as possible mediators between teacher satisfaction and student achievement, these findings should not preclude the study of other possible intermediates.

Samdal *et al.* (1999), for example, found that students' perceptions about their academic achievement was influenced by their own satisfaction with school in general and other indicators of the psychosocial environment of the school. It is conceivable that the

[14] Incentive schemes to boost teacher performance have been recommended in present educational reforms (Avalos, 1996) but the equitable distribution of these based on the varied contexts in which teachers function make this a difficult agenda with which to proceed

feelings of satisfaction of the teacher as a significant other will significantly affect these students' emotions and, through this path, influence achievement. Furthermore, Goddard Spear (1988) found that teacher and student perceptions of Physics and Chemistry, as subjects taught in school, were similar, suggesting that teachers reinforce pupils' ideas concerning the nature of these subjects. It could be hypothesised, therefore, that teacher attitude to the work environment may influence student attitude to the work environment, i.e., teachers may not strive to dispel negative attitudes of students to their learning context, if these are perceptions or attitudes the teacher themselves maintain. Additionally, students' perceptions of, or satisfaction with, the work environment may be affective measures better developed than those students hold of their teacher's job satisfaction as investigated here. An alternative study, therefore, is the employment of student satisfaction with the school environment as an intermediate variable between teacher satisfaction with the school and student achievement.

Further research could also consider the inclusion of the school or classroom climate construct. School climate has been shown to influence job satisfaction (Galloway *et al.*, 1985, Abu-Saad & Hendrix, 1995) and aspects of school climate have been shown to affect student achievement (Hoy & Hannum, 1997). Investigating the relevance of the reverse relationship (the influence of satisfaction upon climate), and climate as an intermediary between satisfaction and student outcomes is yet another alternative to the models proposed in this thesis.

Research may be developed not only through the identification of potential intermediates lying between satisfaction and student outcomes, but may also focus on improving the model already investigated in this thesis. One approach would be to optimise the description of further appropriate background variables, whose control, would help clarify the relationships of the main variables each with the other. The natural predisposition of the teacher to view things in a positive or negative light, and hence report satisfaction at different levels, is but one example (Levin & Stokes, 1989). A measure of additional background variables such as this may improve the accuracy of the prediction of student outcomes from teacher satisfaction if included in the regression associating these variables.

Theoretical refinements may further augment the improvements mentioned above. A review of the possible function of attitudes, for example, may illuminate the relationships found between teacher attitudes to their work and student attitudes to the

subject and their performance. Several of the attitudes to job components may be direct or indirect expressions of threats to the self-esteem of the teacher, poor material rewards and lack of opportunity for career advancement being good examples. These threats may lead to either withdrawal or projection by the teacher of poor attitudes (Katz, 1960), onto the student group, the school or the community. Neither of these would be conducive to a good student-teacher relationship or improved student outcomes. That the strength of such defensive reaction is increased by contexts often unrelated to the attitude expressed (Katz, 1960) suggests that frustrations external to the classroom may also influence the teacher's relationship with the student.

If some of the attitudes teachers express are related to attempts to defend their own self esteem then situations that remove the threat to self esteem (such as increased pay, career advancement and status of the profession) would reduce the negative projections teachers might make. Katz (1960) also suggests catharsis as a means of relieving the symptoms of ego defensive attitudes, and, therefore, once again promotion of cohesion amongst the staff and the continuation of teacher professional groups are recommended, so that teachers have a location into which to vent their frustrations. Furthermore, Katz describes the benefit of self-awareness in tackling ego defensive reactions, a factor that could be tackled in in-service training schemes that serve to make teachers aware of the attitudes they may hold to the students or other components of the job.

Several of the teacher attitudes to job component scales might have multiple functions. A negative attitude to salary may develop not only in a form of esteem defence but be created in response to the deprivation of a need, perhaps an economic one. Change in this attitude may be achieved through simply satisfying the need for a better salary. Further research may benefit, therefore, from taking a more functional approach to the attitudes teachers hold, investigating why teachers have certain attitudes, why these attitudes are aroused and how they may eventually be modified.

It should be considered, when trying to relate teachers' perceptions or reactions to their work environment to student outcome, that the construct of teacher job satisfaction is not the only construct that could utilised. Alternative perspectives revolving round work centrality, motivation and teacher commitment may also be considered.

There is a tendency for overall job satisfaction to be reward driven (Chapter 7 and Poppleton, 1989) and work centrality to be value driven (Riseborough & Poppleton,

1990b). As teacher values were more frequent in their association with student attitude to the class and teacher, than were reward scales, the influence of the teacher upon student attitude may be better studied through measurement of work centrality rather than satisfaction. It could, therefore be recommended that if teacher sentiments are to be channelled in such a way as to optimise student attitudes, then the relationship between teacher work centrality and student outcomes, may be a useful route to follow.

Teacher motivation, being more related to actual behaviour than is the satisfaction construct may be another factor worthy of consideration both as an alternative construct to job satisfaction or as an intermediate variable between this and student outcome. Investigating the relationship between satisfaction and motivation, and/or behaviour, and between teacher motivation and student outcome, therefore, may help explain the manner in which teachers' job satisfaction might influence their students. If teachers' satisfaction can be related to their actual motivations, theories such as Maslow's needs hierarchy may become applicable. For example, can teachers who are not fulfilled by lower level needs such as economic survival, be motivated to fulfil higher order self actualisation needs that should improve them as teachers?

Work on teacher organisational commitment may be yet another avenue to explore, again both in an alternative and intermediary capacity. Reported significance of positive relationships between organisational commitment and job satisfaction on the one hand and organisational commitment and student achievement, on the other, encourages the hypothesis that relationships exist between teacher job satisfaction and student achievement as linked by the variable of organisational commitment. The role of teacher commitment in professional satisfaction is reiterated by Arancibia & Alvarez (1994) in the Chilean environment, and it would be worth investigating how teacher commitment is expressed by teachers in the classroom environment and the degree to which, and in what form students are aware of this commitment.

10.4. Methodological conclusions and recommendations

There was much convergence between the scales of the Likert style questions and the data collected for the open-ended questionnaire, which contextually validates the adapted TPS instrument for the Chilean region. The instrument may be developed further, however, by the inclusion of scales describing the relationships held with students, student behaviours and background. The addition of themes related to the

teacher's role as a developer, allocation of time to the subject and the number and arrangement of working hours would further benefit the instrument for use in this environment.

The length of the questionnaire was a concern especially if teachers have both time and workload constraints as would seem to the case in this sample. They may not, therefore, have had the time to complete these questionnaires in as much detail or with as great care as would be desired. If the questionnaire is to be reduced out of consideration of the teachers' time as well as the accuracy of the measurement, it may be recommended that scales measuring roles and responsibilities be removed, as these interacted the least with student outcome variables.

It was decided that the overall job satisfaction scale was generally not of use in trying to relate job satisfaction to student outcomes, and that scales directed specifically at individual job components be utilised..

Differences between Biology, Chemistry and Physics are evident throughout analyses, in terms of the student outcomes measured, the characteristics teachers hold and the way in which teachers' perceptions and values are associated with student outcomes. Future researchers would do well, therefore, to continue to keep these subjects separate, although they might investigate further into why these differences in subjects occur. There was an impression that Biology and Chemistry contexts were more alike but reasons why the Physics classroom stands apart is not yet clear.

When it came to the contribution values might make to overall teacher job satisfaction independent of reward scales, there was some doubt if the separate measurement of values was necessary, and that the importance placed upon a job attribute might already be manifest in the perceptions the teachers hold and report. A firm rejection of these scales cannot be completely recommended, however, as the inclusion of values does increase the amount of variance in overall job satisfaction that can be explained. In general, however, it would seem that, as Poppleton (1989) suggests, overall job satisfaction is very much reward driven. The influence of background characteristics upon the relationships between reward and value measurements (O'Brien & Dowling, 1980) could now be investigated further.

Values should remain considered in analyses where teacher reward and value scales are associated with student outcomes. No clear indication as to whether the teachers' value system or their perceptions of rewards have greater influences on student outcomes, justify the abandonment of value measurements in this context, a similar number of significant relationships arising for both. Although Poppleton (1989) may be correct in assuming that values are intrinsic to the reward measurement, further research involving the simultaneous regression of these value/reward components onto each student outcome, will enable decisions to be made as to their individual weightings in relation to the student outcome of interest.

Values tended to be associated more frequently with student attitudes, where rewards were more often linked with achievement. This suggests that to some degree rewards may reflect the practical situation of the teaching environment that itself affects student performance, whereas value measures reflect the nature of the teacher more exclusively, and are involved with the teacher-student relationship as a result.

It needs to be considered also if the division of satisfaction into reward and value components is only appropriate for studies aiming to determine the contributors to overall job satisfaction. The use of a scale measuring satisfaction as a whole construct, but specifically for each job characteristic, may be a more fruitful avenue of investigation.

A last word on methodological issues involves the use of quantitative methodology in this study. The use, thereof, has been defended earlier, but the consequences of the analyses have proved this to be appropriate as an initial exploration into the theme at hand. Areas of interest have been highlighted and questions generated through this approach, upon which the more probing qualitative techniques, such as interviews, can now be anchored. Attempting a qualitative analysis without this initial framework would have been very difficult in terms of generating questions on a topic, the relationship between student outcome and teacher satisfaction, of which little is known. The relative limitations that arose in the open-ended items in the survey instruments, questions that were generated prior to the quantitative analysis, are testimony to this.

10.5. Further recommendations and limitations

As with any exploratory research, limitations and improvements to the work became evident during the process of investigation and need to be highlighted. A discussion of these puts into perspective the practical applications of the knowledge generated here.

Several of the limitations are statistical in nature:

Regression equations describing the variety of relationships discussed, cannot as yet be described as optimum as a large amount of variance still remains unexplained. It is suggested that future work is needed to locate appropriate background variables, teacher negativity being one discussed, that, if inserted into the analysis, improve the prediction of student outcome.

Furthermore, different job components, thus far analysed separately, could be regressed simultaneously onto student dependent variables with the purpose of increasing the power of the predictions. This would also allow an estimation of the relative importance of each scale if compared to another and the possibility of interaction between teacher attitudes to different job components.

Based on the fact that the direction of some of the relationships between teacher reward/value scales and student outcomes seemed contrary to expectation, it is also recommended that the possibility of non-linear relationships is investigated.

Clustering into class groups is very evident in several of variables, student achievement, student attitude to the teacher and student perceptions of teacher job satisfaction scales in particular. It is, therefore, essential that the between group variance is accounted for in analysis, using procedures such as multilevel modelling. This has been utilised in this research but caution is necessary in interpreting the results because of the small size of the sample. It is recommended, therefore, that the research is repeated but with larger samples of teachers and classes so that the power of the technique can be fully exploited. Future work could also concentrate upon the development of a random components model, that includes variation in the slope coefficient of different groups, so as to better understand the difference in manner in which student outcomes and teacher satisfaction may relate to each other from one group to the next. Future research

designers are further encouraged to include a third level of analysis, namely the school, so that variance attributable to both class and school can be accounted for adequately.

Sample size imposes restrictions upon other areas of the study as well. In the analysis of the more qualitative data, for example, cell counts in some instances are a cause for concern in cross tabulations even though the more robust Fisher statistic is utilised in significance testing where possible. Furthermore, in regression, ANOVA, t-tests and correlation analyses relatively high levels of association needed to be met before significance of relationships could be accepted, a fact linked to the small teacher sample being analysed. Finally, any research that aims to change policy and bring about effective change, needs eventually to be extrapolated beyond the small sample drawn in the La Serena/Coquimbo urban zones. Greater sample sizes from a range of regions drawn by probability methods of sampling would improve the generalisability of the findings and recommendations upon which national rather than regional educational policy makers might act.

Theoretical limitations are also evident:

A clear differentiation should be made to teachers in future samples as to whether they must respond in terms of job fulfilment or job comfort (Evans, 1997). It is tempting to believe that teachers may consider both in their replies but if they are favouring one interpretation at the exclusion of the other, clarification might produce a more accurate classification of the nature of job satisfaction in the profession.

Evans warns of the danger of making assumptions about what is satisfying or satisfactory to others. It is, therefore difficult to make judgements on which of the categories formed in this study represent either the job comfort or job fulfilment type responses. Dissatisfaction with salary, for example, might for some teachers be a reinforcer of their feelings of personal achievement; i.e. recognition of having received a university education and being a professional. Other teachers, however, may see salary in terms only of job and life comfort.

Confusion between the two interpretations of the job satisfaction construct may explain the greater variety of items found in the satisfaction categories, a result perhaps of the inclusion of both job fulfilment and job comfort responses. In the dissatisfaction categories, however, this dual interpretation may be less frequent.

It is strongly recommended in the light of the ambiguity described above, that a thorough concept analysis of the job satisfaction construct within the teaching field be undertaken. This technique of concept elucidation is well developed in the field of nursing (Rodgers, 1993; Morse, 1995; Walker & Avant, 1995) and involves the identification and clear demarcation of concept attributes, antecedents, consequences, surrogate and related terms and illustrative model cases. Although this has been achieved to a degree in the review of the literature in this thesis, this technique delves further into the identity of the concept by locating contrary and related case examples as well as measuring the level of maturity or understanding of the concept in the profession as well as in academia. A thorough review of the job satisfaction construct as described by concept analysis writers, is highly recommended.

An assumption made in the frameworks presented in this thesis (Figures 4.01 and 4.02; Chapter 4) is that teacher attitudes to their work are expressed in their behaviour. As doubt is cast on the consistency of attitude and student behaviour, so may similar concerns be voiced on the relationship between teachers' attitude to their work and their behaviour in the classroom. A behavioural measure was excluded from the project design because of the expenditure of time and the financial demands that this measurement would have caused. As the research evolved, however, and the relevant relationships arose, the requirement for behavioural measurement became evident. The inclusion of measures of teacher behaviour that go beyond self-report, is essential in the future so as to determine the extent to which satisfaction may be reflected in teaching practice. This has been achieved to some degree by Perry *et al.* (1995) but a continuation of the model to incorporate student outcome would be of worth.

Time constraints limited the approach to the study to a chiefly psychological one, using a psychological model as the framework and the individual student or teacher as the unit of analysis where possible, although group variance is accounted for in some of the regression analyses. Some attempt has been made in the study to situate the teacher and pupil in terms of the administration of the school in which they work/learn, or the historical space in which they find themselves, for example, but the research would benefit further from a more sociological extension. This, alongside the present psychological perspective, would provide a more complete understanding of teacher satisfaction and student outcomes. Furthermore, by confining the study in this way, much of the prominent sociological writings relating to the nature of work had to be ignored. Marx's writings on alienated labour is but one example and careful analysis

and application of the richness embodied in such writings may provide an alternative slant to teacher alienation from work, colleagues and students.

Despite these limitations, this thesis has shown that there is some evidence to support the assumption that *a happy teacher is a better one,* and it has provided an initial explanation as to how teacher job satisfaction may be related to the student outcomes under study. Much scope remains, however, to build upon the findings described and to improve general understanding of this teacher–student interaction.

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Appendices

APPENDIX 1 STUDENT QUESTIONNAIRE-ENGLISH VERSION

Attitude towards science

Researcher: Sarah Hean

(51)214550

University of La Serena
Campos Andrés Bello
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PERSONAL INFORMATION

a) Please mark the correct square:

male ☐

female ☐

b) Please answer the following questions in the spaces provided:

What is your date of birth (e.g., 17 March 1983)?

Name?

Dear Student

The purpose of this questionnaire is to find out:

1) How you feel about Biology, Chemistry and Physics as subjects taught in school

2) How you feel about Science as a career

There are no right or wrong answers and all answers are equally correct. We would like you to give your own opinion on each of the statements provided.

Your answers will only be viewed by the researcher. Nobody else.

Please read the following instructions carefully.

Place a tick in the box next to the statement that most reflects your opinion. Please tick ONE BOX ONLY, per question.

Example

Mad dogs are dangerous

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

Please try and answer all the questions provided.

Rub out clearly any answer you wish to change.

Do not think too long on any one statement - give the first 'natural' answer that comes to you.

Now try some of the following practice questions:

Practice questions

a) Science should only be taught to girls and boys that want to learn it.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

b) I enjoy doing my Biology homework?

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

DO NOT TURN OVER UNTIL TOLD TO DO SO

PART 1: MY INTEREST IN SCIENCE AS A CAREER

1. I would *dislike* being a scientist after I leave school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. I would *dislike* a job in a Science laboratory

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. I would find a job as a scientist boring

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. I would like to be a scientist when I leave school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. I would like to work with people who make discoveries in Science when I leave school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. I would find working with Science researchers boring

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. I would find working in a Science laboratory an interesting way to earn a living

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. I would like to specialise in Science if I had the chance

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

9. In my future career, I would like to use the Science I learned at school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

PART 2: CHEMISTRY

(a) How do you feel about Chemistry lessons ?

1. I would enjoy school more if there were *no* Chemistry lessons

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. I do *not* like Chemistry at school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. I look forward to Chemistry lessons each week

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. I *dislike* that I have to study Chemistry at school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. I find Chemistry an enjoyable subject

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. I find Chemistry an interesting subject

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. I have a positive opinion about Chemistry

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. Chemistry lessons are a *waste* of time

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

9. Chemistry lessons are *not* as interesting as other lessons at school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

PLEASE TURN OVER

(b) My relationship with my Chemistry teacher

1. My Chemistry teacher is one of the nicest teachers in the school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. I enjoy working for my Chemistry teacher

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. Sometimes my Chemistry teacher makes me feel stupid.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. My Chemistry teacher does *not* expect me to get good grades

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. My Chemistry teacher has no sense of humour

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. I like my Chemistry teacher

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. My Chemistry teacher helps me understand difficult concepts

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. My Chemistry teacher is *not* a nice person

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

(c) How happy is my Chemistry teacher?

1. My Chemistry teacher enjoys working with other teachers in the school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. My Chemistry teacher does *not* like the physical environment in which she/he works.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. My Chemistry teacher likes working with her/his students.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. My Chemistry teacher enjoys teaching us about Chemistry.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. My Chemistry teacher finds the subject s/he teaches interesting.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. My Chemistry teacher enjoys working at our school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. My Chemistry teacher does *not* enjoy teaching.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. I think my Chemistry teacher has too much to do.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

9. My Chemistry teacher is *not* well motivated

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

10. In general, the state of animation/mood of my Chemistry teacher is good.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

PLEASE TURN TO THE NEXT PAGE

1. Do you think your teacher is happy with the work she does? *(Please mark one of the squares):*

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

2. Do you think the satisfaction of your teacher affects the ATTITUDE you have towards Chemistry?

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

3. Do you think that the satisfaction of the teacher affects your ACHIEVEMENT in Chemistry?

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

4. For how many years have you been taught by your Chemistry teacher? *(Please mark one of the squares):*

1998 only ☐

1998 and 1997 ☐

more ☐

PART 3: BIOLOGY

(a) How do you feel about Biology lessons?

1. I would enjoy school more if there were *no* Biology lessons

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. I do *not* like Biology at school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. I look forward to Biology lessons each week

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. I *dislike* that I have to study Biology at school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. I find Biology an enjoyable subject

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. I find Biology an interesting subject

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. I have a positive opinion about Biology

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. Biology lessons are a *waste* of time

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

9. Biology lessons are *not* as interesting as other lessons at school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

PLEASE TURN OVER

(b) My relationship with my Biology teacher

1. My Biology teacher is one of the nicest teachers in the school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. I enjoy working for my Biology teacher

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. Sometimes my Biology teacher makes me feel stupid.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. My Biology teacher does *not* expect me to get good grades

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. My Biology teacher has no sense of humour.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. I like my Biology teacher

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. My Biology teacher helps me understand difficult concepts

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. My Biology teacher is *not* a nice person

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

(c) How happy is my Biology teacher?

1. My Biology teacher enjoys working with other teachers in the school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. My Biology teacher does *not* like the physical environment in which she/he works.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. My Biology teacher likes working with her/his students.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. My Biology teacher enjoys teaching us about Biology.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. My Biology teacher finds the subject he/she teaches interesting.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. My Biology teacher enjoys working at our school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. My Biology teacher does *not* enjoy teaching.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. I think my Biology teacher has too much to do.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

9. My Biology teacher is *not* well motivated

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

10. In general, the state of animation/mood of my Biology teacher is good.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

PLEASE TURN TO THE NEXT PAGE

1. Do you think your teacher is happy with the work s/he does? *(Please mark one of the squares):*

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

2. Do you think the satisfaction of your teacher affects the ATTITUDE you have towards Biology?

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

3. Do you think that the satisfaction of the teacher affects your ACHIEVEMENT in Biology?

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

4. For how many years have you been taught by your Biology teacher? *(Please mark one of the squares):*

1998 only ☐

1998 and 1997 ☐

more ☐

PART 4: PHYSICS

(a) How do you feel about Physics lessons

1. I would enjoy school more if there were *no* Physics lessons

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. I do *not* like Physics at school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. I look forward to Physics lessons each week

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. I *dislike* that I have to study Physics at school

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. I find Physics an enjoyable subject

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. I find Physics an interesting subject

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. I have a positive opinion about Physics

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. Physics lessons are a *waste* of time

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

9. Physics lessons are *not* as interesting as other lessons at school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

PLEASE TURN OVER

(b) My relationship with my Physics teacher

1. My Physics teacher is one of the nicest teachers in the school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. I enjoy working for my Physics teacher

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. Sometimes my Physics teacher makes me feel stupid.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. My Physics teacher does *not* expect me to get good grades

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. My Physics teacher has no sense of humour.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. I like my Physics teacher

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. My Physics teacher helps me understand difficult concepts

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. My Physics teacher is *not* a nice person

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

(c) How happy is my Physics teacher

1. My Physics teacher enjoys working with other teachers in the school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

2. My Physics teacher does *not* like the physical environment in which she/he works.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

3. My Physics teacher likes working with her/his students.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

4. My Physics teacher enjoys teaching us about Physics.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

5. My Physics teacher finds the subject he/she teaches interesting.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

6. My Physics teacher enjoys working at our school.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

7. My Physics teacher does *not* enjoy teaching.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

8. I think my Physics teacher has too much to do.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

9. My Physics teacher is *not* well motivated

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

10. In general, the state of animation/mood of my Physics teacher is good.

Strongly agree	Agree	Not sure	Disagree	Strongly disagree
☐	☐	☐	☐	☐

PLEASE TURN TO THE NEXT PAGE

1. Do you think your teacher is happy with the work s/he does? *(Please mark one of the squares):*

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

2. Do you think the satisfaction of your teacher affects the ATTITUDE you have towards Physics?

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

3. Do you think that the satisfaction of the teacher affects your ACHIEVEMENT in Physics?

Yes ☐

No ☐

Explain your answer in the space below *(Please print clearly)*

---

4. For how many years have you been taught by your Physics teacher? *(Please mark one of the squares):*

1998 only ☐

1998 and 1997 ☐

more ☐

Thank you for your help

APPENDIX 2 STUDENT QUESTIONNAIRE-SPANISH VERSION

Actitud hacia las Ciencias

Investigadora: Sarah Hean
(51)214550

Universidad de la Serena
Campos Andrés Bello
Avenida Raúl Bitran, s\n
La Serena
Chile

Universidad de Bristol
Colegio de Educación
Berkeley Square
Bristol
UK

INFORMACIÓN PERSONAL

a) Por favor marque el cuadro correcto:

hombre ☐

mujer ☐

b) Por favor conteste las siguientes preguntas en los espacios dados

¿Cuál es su fecha de nacimiento (ejemplo 17 de Marzo de 1983)**?**

¿Nombre?

Estimado Estudiante:

El propósito de este cuestionario es averiguar:

1) Qué piensa usted respecto a la manera en que son enseñadas las asignaturas de Biología, Química y Física en el colegio.

2) Qué piensa usted respecto a las Ciencias como una carrera.

No hay respuestas correctas o incorrectas, todas las respuestas son igualmente correctas. Nos gustaría que diera su propia opinión sobre cada una de las afirmaciones dadas.

Sus respuestas serán vistas solamente por la investigadora. Por nadie más.

Por favor lea las siguientes instrucciones cuidadosamente.

Marque el cuadro al lado de la afirmación que mejor refleje su opinión. Por favor marque SOLAMENTE UN CUADRO por pregunta.

Ejemplo

Los perros bravos son peligrosos

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

Por favor trate de responder a todas las preguntas dadas.

Borre completamente cualquier respuesta si quiere hacer un cambio.

No piense demasiado para responder las preguntas -dé la primera respuesta que le venga a la mente.

Ahora practique con las siguientes preguntas:

Preguntas de práctica

a) La asignatura de Ciencias sólo debería enseñarse a niños y niñas que quieran aprenderla.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

b) Disfruto haciendo mis tareas de biología

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

PASE A LA PÁGINA SIGUIENTE

PARTE 1: MI INTERÉS EN LAS CIENCIAS COMO UNA CARRERA

1. N*o me gustaría* ser un científico/a cuando termine el colegio

Estoy muy de Acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. N*o me gustaría* un trabajo en un laboratorio científico

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Trabajar como científico/a me parecería aburrido

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. Me gustaría ser un científico/a cuando termine el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Me gustaría trabajar con personas que hacen descubrimientos científicos cuando termine el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Me parecería aburrido trabajar con investigadores/as en el área de las Ciencias

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. Trabajar en un laboratorio científico me parecería una manera interesante de ganarme la vida

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Me gustaría especializarme en las Ciencias si tuviera la oportunidad

Estoy muy de Acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

9. En mi futura carrera, me gustaría utilizar las Ciencias que he aprendido en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

PARTE 2: QUÍMICA

(a) Cuál es su opinión sobre las clases de Química?

1. Me gustaría más el colegio si *no* hubiera clases de Química

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. *No* me gusta la Química en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Espero cada semana las clases de Química

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. *No me gusta* tener que estudiar Química en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Química me parece una asignatura agradable

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Química es una asignatura interesante

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. La opinión que tengo sobre la Química es positiva

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Las clases de Química son *una pérdida* de tiempo

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

9. Las clases de Química *no* son tan interesantes como otras clases en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

POR FAVOR PASE A LA SIGUIENTE PAGINA

(b) ¿Mi relación con mi profesor/a de Química?

1. Mi profesor/a de Química es uno de los profesores/as más agradables del colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. Me gusta trabajar para mi profesor/a de Química

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Algunas veces mi profesor/a de Química me hace sentir como un tonto/a

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. Mi profesor/a de Química *no* espera que saque buenas notas

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Mi profesor/a de Química *no* tiene sentido del humor

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Me gusta mi profesor/a de Química

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. Mi profesor/a de Química me ayuda a entender conceptos difíciles

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Mi profesor/a de Química *no* es simpático

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

(c) ¿Qué tan feliz es mi profesor/a de Química

1. A mi profesor/a de Química le gusta trabajar con otros profesores/as en el colegio.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. A mi profesor/a de Química *no* le gusta el entorno físico donde trabaja.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Mi profesor/a de Química le gusta trabajando con sus estudiantes.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. Mi profesor/a de Química disfruta enseñándonos sobre Química.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Mi profesor/a de Química encuentra interesante la asignatura que enseña.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Mi profesor/a de Química *no* disfruta trabajando en nuestro colegio.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. Mi profesor/a de Química *no* disfruta enseñando.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Pienso que mi profesor/a de Química tiene demasiado que hacer.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

9. Mi profesor/a de Química *no* es bien motivado

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

10. En general, el estado de ánimo de mi profesor/a de Química es bueno.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

1. ¿Piensa usted que su profesor/a de Química está contento/a con el trabajo que el/ella desempeño? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

2. ¿ Piensa usted que la satisfacción de su profesor/a influye en la ACTITUD que usted tiene hacia la Química? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

3. ¿ Piensa usted que la satisfacción de su profesor/a afecta el RENDIMIENTO de usted en Química ? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

4. ¿Durante cuántos años ha tenido usted su profesor/a de Química? *(Por favor marque uno de los cuadros):*

1998 solo ☐

1998 y 1997 ☐

más ☐

PARTE 3: BIOLOGÍA

(a) Cuál es su opinión sobre las clases de Biología?

1. Me gustaría más el colegio si *no* hubiera clases de Biología

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. *No* me gusta la Biología en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Espero cada semana las clases de Biología

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. *No me gusta* tener que estudiar Biología en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Biología me parece una asignatura agradable

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Biología es una asignatura interesante

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. La opinión que tengo sobre la Biología es positiva

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Las clases de Biología son *una pérdida* de tiempo

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

9. Las clases de Biología *no* son tan interesantes como otras clases en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

(b) Mi relación con mi profesor/a de Biología

1. Mi profesor/a de Biología es uno de los profesores/as más agradables del colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. Me gusta trabajar para mi profesor/a de Biología

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Algunas veces mi profesor/a de Biología me hace sentir como un tonto/a

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. Mi profesor/a de Biología *no* espera que saque buenas notas

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Mi profesor/a de Biología *no* tiene sentido del humor

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Me gusta mi profesor/a de Biología

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. Mi profesor/a de Biología me ayuda a entender conceptos difíciles

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Mi profesor/a de Biología *no* es simpático

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

(c) ¿Qué tan feliz es mi profesor/a de Biología?

1. A mi profesor/a de Biología le gusta trabajar con otros profesores/as en el colegio.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. A mi profesor/a de Biología *no* le gusta el entorno físico donde trabaja.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Mi profesor/a de Biología le gusta trabajando con sus estudiantes.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. Mi profesor/a de Biología disfruta enseñándonos sobre Biología.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Mi profesor/a de Biología encuentra interesante la asignatura que enseña.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Mi profesor/a de Biología *no* disfruta trabajando en nuestro colegio.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. Mi profesor/a de Biología *no* disfruta enseñando.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Pienso que mi profesor/a de Biología tiene demasiado que hacer.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

9. Mi profesor/a de Biología *no* es bien motivado

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

10. En general, el estado de ánimo de mi profesor/a de Biología es bueno.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

1. ¿Piensa usted que su profesor/a de Biología está contento/a con el trabajo que el/ella desempeño? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

2. ¿ Piensa usted que la satisfacción de su profesor/a influye en la ACTITUD que usted tiene hacia la Biología? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

3. ¿ Piensa usted que la satisfacción de su profesor/a afecta el RENDIMIENTO de usted en Biología ? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

4. ¿Durante cuántos años ha tenido usted su profesor/a de Biología? *(Por favor marque uno de los cuadros):*

1998 solo ☐

1998 y 1997 ☐

más ☐

PARTE 4: FISICA

(a) Cuál es su opinión sobre las clases de Fisica

1. Me gustaría más el colegio si *no* hubiera clases de Fisica

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. *No* me gusta la Fisica en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Espero cada semana las clases de Fisica

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. *No me gusta* tener que estudiar Fisica en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Fisica me parece una asignatura agradable

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Fisica es una asignatura interesante

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. La opinión que tengo sobre la Fisica es positiva

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Las clases de Fisica son *una pérdida* de tiempo

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

9. Las clases de Fisica *no* son tan interesantes como otras clases en el colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

POR FAVOR PASE A LA SIGUIENTE PAGINA

(b) Mi relación con mi profesor/a de Fisica

1. Mi profesor/a de Fisica es uno de los profesores/as más agradables del colegio

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. Me gusta trabajar para mi profesor/a de Fisica

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Algunas veces mi profesor/a de Fisica me hace sentir como un tonto/a

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. Mi profesor/a de Fisica *no* espera que saque buenas notas

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Mi profesor/a de Fisica *no* tiene sentido del humor

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Me gusta mi profesor/a de Fisica

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. Mi profesor/a de Fisica me ayuda a entender conceptos difíciles

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Mi profesor/a de Fisica *no* es simpático

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

(c) ¿Qué tan feliz es mi profesor/a de Fisica

1. A mi profesor/a de Fisica le gusta trabajar con otros profesores/as en el colegio.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

2. A mi profesor/a de Fisica *no* le gusta el entorno físico donde trabaja.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

3. Mi profesor/a de Fisica le gusta trabajando con sus estudiantes.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

4. Mi profesor/a de Fisica disfruta enseñándonos sobre Fisica.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

5. Mi profesor/a de Fisica encuentra interesante la asignatura que enseña.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

6. Mi profesor/a de Fisica *no* disfruta trabajando en nuestro colegio.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

7. Mi profesor/a de Fisica *no* disfruta enseñando.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

8. Pienso que mi profesor/a de Fisica tiene demasiado que hacer.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

9. Mi profesor/a de Fisica *no* es bien motivado

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

10. En general, el estado de ánimo de mi profesor/a de Fisica es bueno.

Estoy muy de acuerdo	Estoy de acuerdo	No estoy seguro/a	Estoy en desacuerdo	Estoy muy en desacuerdo
☐	☐	☐	☐	☐

1. ¿Piensa usted que su profesor/a de Fisica está contento/a con el trabajo que el/ella desempeño? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

2. ¿ Piensa usted que la satisfacción de su profesor/a influye en la ACTITUD que usted tiene hacia la Fisica? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

3. ¿ Piensa usted que la satisfacción de su profesor/a afecta el RENDIMIENTO de usted en Fisica ? *(Por favor marque uno de los cuadros):*

Sí ☐

No ☐

Explique su respuesta en el espacio debajo *(Por favor escribe claro y en letras imprenta)*

---

4. ¿Durante cuántos años ha tenido usted su profesor/a de Fisica? *(Por favor marque uno de los cuadros):*

1998 solo ☐

1998 y 1997 ☐

más ☐

GRACIAS POR SU AYUDA

APPENDIX 3 INSTRUMENT SCORING FOR THE STUDENT QUESTIONNAIRE, TEACHER QUESTIONNAIRE AND STUDENT INDEPENDENT ACHIEVEMENT TEST

A3.1. Scoring for student questionnaire

It will be remembered from Chapter 2 (Section 2.3.1.4) that a general attitude can be described by the following equation:

$$A_o = \sum_{n=1}^{n=i} (b_i e_i)$$

(Fishbein & Ajzen, 1975)

bi = the subjective probability that an attribute is associated with the attitude object in the belief statement provided. This judgement is made by the respondent in selecting a category in the questionnaire. In Likert scaling the subjective probability is measured on a 5-point scale as follows:

Strongly agree	+2
Agree	+1
Unsure	0
Disagree	-1
Strongly disagree	-2

e.g. the probability that the attribute of 'fun' is associated with the attitude object 'science lessons', may be given, by a science student respondent, the subjective probability of +1 (i.e. agree).

ei = is the evaluation or value given to a particular attribute (i.e., fun is evaluated as a positive attribute and boring as negative). In Likert scaling, the value of an attribute is allocated on the basis of the judgement of the instrument developer (and in this work the judgements of 3 others). Attributes that evoke a neutral evaluation are discarded and a value of either +1 for positive attributes (e.g. fun) or -1 for negative ones (e.g. boring) are allocated. Note that in such scaling subjective probability gains greater weightings than do evaluations.

The overall attitude to a particular attitude object (A_o) is calculated by the sum of the products of b_i and e_i for all belief statements (1 to n) concerned with it (Figure 2.01, Chapter 2). That is, in a scale designed to measure the overall attitude of a student to

her science lessons, the b_i e_i product for all items will be calculated and summed to produce the score for attitude to science lessons.

An attribute may be strongly associated with the attitude object but if the value placed on the attribute is low, the contribution of the belief statement to the overall attitude will be low also. Consider the item "science lessons are informative". The student may strongly associate the attribute of informative with the attitude science lessons, but value the attribute very lowly. Such a belief will not contribute greatly to the overall attitude to science lessons, therefore.

The possible b_i e_i product scores for items evaluated as positive in value (+1) are:

Strongly agree	+2
Agree	+1
Unsure	0
Disagree	-1
Strongly disagree	-2

e.g., the b_i e_i product for 'science is fun', with which the student strongly agreed is (+2) *(+1) = +2

and for statements given a negative evaluation(-1):

Strongly agree	-2
Agree	-1
Unsure	0
Disagree	+1
Strongly disagree	+2

e.g., the b_i e_i product for 'science is boring', with which the student strongly disagreed is (-2) * (-1)= +2

The maximum score possible for a scale containing x positive statements and y negative statements is, therefore:

(x *+2) +(y * +2).

The minimum score is:

(x * -2) + (y * -2).

Average scale scores were calculated based upon the sum of the component scale items. This creates for each scale a possible maximum and minimum score of 2 (strongly agree) and –2 (strongly disagree) respectively.

A3.2. Scoring for teacher questionnaire

A3.2.1.Overall job satisfaction scale

Four categories were available in responses to the overall job satisfaction scale (Table A3.01).

Table A3.01: Scoring for overall job satisfaction scale

Category	Score
A great deal	1.0
To some extent	0.5
Not much/Very little	0.0

As very few teachers responded to the *very little* category, the *not much* and *very little* categories were merged and received a 0.0 score.

A3.2.2.Job characteristics scales

Three categories were possible per item in both the reward and value divisions of each scale measuring specific job characteristics (Table A3.02 and Table A3.03).

Table A3.02: Scoring for job component reward scales

Category	Score
A lot	1.0
To some extent	0.5
Little	0.0

Table A3.03: Scoring for job component value scales

Category	Score
Very important	1.0
To some extent	0.5
Of little importance	0.0

Average scale scores were calculated based upon the sum of the component scale items. This creates for each scale a possible maximum and minimum score of 1.0 and 0.0 respectively.

A total score was calculated for each value and reward scale. In Analyses using SPSS, missing data was coded as such. In MLM analyses missing data was replaced by mean values for continuous type data and removed from analyses when ordinal in nature.

A3.3. Scoring for student achievement tests

A3.3.1.Independent achievement test

Each item in the independent achievement test was equally weighted with a score of 1 point, the maximum score being 15 for each subject.

A3.3.2.Term marks

The majority of term marks selected were from the first semester of the academic year. Where trimestral reports were made on student progress, the average of the first two trimesters was utilised. A maximum of 7.0 is attainable.

In analyses using SPSS, for all three instruments, missing data was coded as such. In MLM analyses missing data was replaced by mean values for continuous type data and removed from analyses when ordinal in nature.

APPENDIX 4 TEACHER QUESTIONNAIRE-ENGLISH VERSION

BEFORE COMPLETING THIS QUESTIONNAIRE, PLEASE COMPLETE THE FOLLOWING TABLE

We would like you to make a distinction between your satisfaction/dissatisfaction with **respect to the job** you have at present in your school(s) and the satisfaction/dissatisfaction you have **with respect to the career of teaching as a profession.**

What factors contribute to your present **satisfaction** with the **job you presently** hold?	What factors contribute to your present **satisfaction** with the **career of teaching as a profession?**
1. ----------	1. ----------
2. ----------	2. ----------
3. ----------	3. ----------
4. ----------	4. ----------
5. ----------	5. ----------

What factors contribute to your present **dissatisfaction** with the **job you presently** hold?	What factors contribute to your present **dissatisfaction** with the **career of teaching as a profession?**
6. _____	6. _____
7. _____	7. _____
8. _____	8. _____
9. _____	9. _____
10. _____	10. _____

JOB SATISFACTION IN TEACHING
A survey for secondary science teachers

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THE STUDY

This research study hopes to identify which factors continue to contribute to job satisfaction in teaching and which factors teachers find difficult in establishing professional recognition.

To answer these questions we want to consult teachers in government subsidised secondary schools in the IV region. Information will be collected through this questionnaire and subsequent interviews.

We do not believe the answers are by any means obvious but at the end of the project we shall report back to all participating schools.

THE SURVEY

This question had 6 parts: Part 1 asks some questions about your teaching career; Part 2 is about your satisfaction with the job you hold at present; Part 3 is about your working conditions; Part 4 your roles and responsibilities; Part 5 on the aspects of classroom practice and finally Part 6 asks for some personal details.

ALL INFORMATION YOU GIVE WILL BE TREATED AS STRICTLY CONFIDENTIAL.

WHEN YOU HAVE COMPLETED THE QUESTIONNAIRE, please place it in the envelope provided, seal the envelope and return it to .....before the.....

If you have any enquiries about this survey, please contact Sarah Hean, Tel:214550/204461

Part 1 MY TEACHING CAREER

In this section we ask a few questions about your general satisfaction with teaching and some information about your career pattern.

1. **In general, how much do you enjoy teaching as an occupation?(*Please circle your answer)***

A great deal to some extent not much very little

2. **In general, how well would you say that teaching measures up to THE SORT OF WORK YOU WANTED when you entered the profession? (*Please circle your answer)***

A great deal to some extent not much very little

3. **Knowing what you know now, if you had to decide all over again whether to enter teaching, how likely is it that you would so?(*Please circle your answer)***

A great deal to some extent not much very little

4. **How able are you to meet your work life goals in a teaching job? (*Please circle your answer)***

A great deal to some extent not much very little

5. For how many years have you worked as a teacher? *(Please enter the nearest whole number)*----------years

PART 2 THE EXPERIENCE OF WORK

In this section we ask some question on your level of satisfaction with your present job.

1. **Considering all things, and thinking now about the teaching post you presently hold, how satisfied would you say you are with your present job? (*Please circle your answer)***

A great deal to some extent not much very little

2 How satisfied are you with your overall quality of your present job?

A great deal to some extent not much very little

PART 3 MY WORKING CONDITIONS

We would like you to think about the conditions of your work and how you perceive these to impact on your job satisfaction.

Below is a list of statements that describes various conditions. There are two questions, A and B for each statement.

A asks **how much** each condition **is present** in your job

B asks **how important** each condition is for your job satisfaction **regardless of how much it is present.**

An example of how to complete columns A and B are given in question 1

A				B		
How much of this condition is present in your job			*Please tick one of the columns (√) for each question opposite each statement.*	**How important is this to your job satisfaction**		
most of the time	some of the time	little of the time	**MY TEACHING SITUATION**	very important	to some extent	of little importance
	√		***1. I like my work***	√		
			2. I have the freedom to decide how I work			
			3. The size of my class is reasonable			
			4. Teaching provides an opportunity to use a variety of skills			
			5. My subject is easy to teach			
			6. Teaching is interesting work			
			7. I have control over the goals of my teaching			
			8. Teaching stimulates my creativity			
			9. The subject I teach is intellectually stimulating			

A B

How much of this condition is present in your job			*Please tick one of the columns (√) for each question opposite each statement.*	How important is this to your job satisfaction		
most of the time	some of the time	little of the time	**MY TEACHING SITUATION**	very important	to some extent	of little importance
			10. I have a good understanding of the subject content I teach			
			11. I am responsible for planning my daily lessons			
			12. There are very interesting activities in the teaching my subject			
			13. Teaching my subject encourages originality			
			14. My responsibilities are clearly defined			
			15. My classroom teaching is free from outside interruption			
			16. The amount of school work I have to do at home is reasonable			
			17. I have adequate materials for my work			
			18. I can easily get advice when I need help			
			19. The physical surroundings of my work are pleasant			
			20. The amount of administrative work I have to do is reasonable			

A B

How much of this condition is present in your job			*Please tick one of the columns (√) for each question opposite each statement.*	How important is this to your job satisfaction		
most of the time	some of the time	little of the time	**MY TEACHING SITUATION**	very important	to some extent	of little importance
			21. New practices, implemented by the present reforms, are given enough opportunity to develop in this school			
			22. I have recognition of the work I do			
			23. Opportunities exist to attend courses that will be of benefit to my teaching in school			
			24. I have access to computer facilities			
			25. The time it takes me to get to work is reasonable			
			26. The amount of work that I have at school is reasonable			
			27. I have the opportunity to help develop the policies in my school			
			28. I am personally accountable for the outcomes of my teaching			
			29. I understand the instructional methods I implement in my teaching			
			30. I have sufficient laboratory equipment to teach my subject			
			31. I like teaching my subject to my students			

A B

How much of this condition is present in your job			*Please tick one of the columns (√) for each question opposite each statement.*	How important is this to your job satisfaction		
most of the time	some of the time	little of the time	**MY TEACHING SITUATION**	very important	to some extent	of little importance
			32. I feel encouraged to experiment with different teaching methods			
			33. I have an adequate time table			
			34. I have freedom to decide which methodology I will use in my subject			
			35. I have adequate conditions in the classroom to develop the activities I have planned			

A B

How much of this condition is present in your job			*Please tick one of the columns (√) for each question opposite each statement.*	How important is this to your job satisfaction		
most of the time	some of the time	little of the time	**OTHERS IN MY SCHOOL**	very important	to some extent	of little importance
			1. I have responsive students in my class			
			2. I have the support and co-operation of colleagues			
			3. I have adequate help from support staff			
			4. I have the opportunity for professional interaction with other colleagues.			
			5. Meetings with colleagues are valuable			
			6. I like the colleagues with whom I work			
			7. My immediate superior is helpful to me in my work			
			8. My Head (principal) is successful in getting people to work together			
			9. School policies are carried out in a consistent way			
			10. In my school, staff morale is generally good			
			11. The level of student repetition is reasonable			
			12. The level of student absenteeism is reasonable			
			13. My students respect me as a teacher			
			14. Student attitude to my subject is good			
			15. Student achievement in my subject is good			

A B

How much of this condition is present in your job			*Please tick one of the columns (√) for each question opposite each statement.*	How important is this to your job satisfaction		
most of the time	some of the time	little of the time	**PARENTS AND THE COMMUNITY**	very important	to some extent	of little importance
			1. The parents of my students are supportive			
			2. Teaches in this community are regarded with respect			
			3. There is good contact between school and local groups in the community			
			4. The municipal authorities are supportive			
			5. School-community problems are constructively handled			
			PROFESSIONAL REWARDS			
			1. Job security is good			
			2. Pay is good			
			3. Job benefits, *in addition,* to my salary, are good.			
			4. A teacher's income is enough to live on			
			5. Promotion opportunities in this school are adequate			
			6. Promotions are fairly handled in this school			
			7. The provision of holiday time is good			
			8. I have sufficient working hours			

9. What other factors that have not been mentioned above contribute to your satisfaction or dissatisfaction with your work situation? Indicate which give you satisfaction and which give you dissatisfaction *(Please specify in the space given below)*

---

10. Do you think that your level of satisfaction with your work influences the ATTITUDES of students towards the science subject you teach? *(Please mark the appropriate square)*

Yes ☐

No ☐

Please explain *(Please specify in the space below)*

---

11. Do you think that your level of satisfaction with your work influences the ACHIEVEMENT of students in the science subject you teach? *(Please mark the appropriate square)*

Yes ☐

No ☐

Please explain *(Please specify in the space below)*

PART 3: MY ROLES AND RESPONSIBILITIES

We would like you to think about the broad responsibilities that you have in your present job; and how you view their impact on **your job satisfaction.**

Below is a list of statements that describes various roles and responsibilities.

There are two columns to tick.
Under **A**, you are asked to say **how much you do these things** as part of your job;
Under **B**, you are asked to indicate **how important taking part** in each one is for your job satisfaction;

A				B		
How much do I do this			Please tick one of the columns (√) for each question opposite each statement.	**How important is this to your job satisfaction**		
a lot	to some extent	Little	**I SHARE RESPONSIBILITY FOR ADMINISTRATION IN....**	very important	to some extent	of little importance
			school management			
			my subject department			
			the guidance system			
			I AM INVOLVED IN....			
			initiating parental contact.			
			the supervision of student teachers			
			the induction of new teachers			
			work on school/community relationships			
			counselling individual students			

A				B		
How much do I do this			Please tick one of the columns (√) for each question opposite each statement.	**How important is this to your job satisfaction**		
a lot	to some extent	Little	**I WORK WITH COLLEAGUES ON...**	very important	to some extent	of little importance
			curriculum development			
			evaluation of student progress			
			the welfare of students			
			I UNDERTAKE OTHER ACTIVITIES ...			
			Run club, sport, drama, trips, etc.			
			Study for professional development			
			Participate in research activities			
			attend conferences			
			attend teaching subject associations			
			attend teacher union meetings			
			read professional periodicals			

PART 5 MY PRACTICE AS A CLASSROOM TEACHER

In this section we would like you to think about aspects of your **actual teaching.** A number of classroom practices are listed on page 9 and the **same items** are repeated on page 10.

This time we ask you to place a tick opposite each item under columns A and B on page 9 and Columns C and D on page 10.

A asks **how difficult it is to do** each practice
B asks **how much you do** this practice

A				B		
How difficult is this to do in practice			*Please tick one of the columns (√) for each question opposite each statement.*	**How much do I do this in my teaching?**		
not difficult	quite difficult	difficult		most of the time	some of the time	little of the time
			1. Plan lessons that are based on the differing abilities of students			
			2. Make learning experiences relevant to students' lives and concerns			
			3. Plan lessons with concern for sequence			
			4. Develop a warm, personal relationship with students			
			5. Use a variety of approaches to gain student interest			
			6. Build positive relationships between students			
			7. Communicate clear rules for student behaviour			
			8. Give prompt attention when issues of student behaviour arise			
			9. Clearly inform students of learning objectives			
			10. Clearly acknowledge the good work of individual students			

A B

How difficult is this to do in practice			*Please tick one of the columns (√) for each question opposite each statement.*	How much do I do this in my teaching?		
not difficult	quite difficult	difficult		most of the time	some of the time	little of the time
			11. Return students' work promptly			
			12. Give special attention to developing students' thinking skills			
			13. Give plenty of opportunities for individualised student work			
			14. Be accessible to students outside the classroom			
			15. Seek feedback from students			
			16. Give students feedback about their efforts to learn			
			17. Use a variety of approaches to gain student participation			

Here is the **same list** of things with two **different questions**

Please tick under columns **C** and **D.**

C asks **how important** each practice is for your job satisfaction.

D asks **how important each practice is for the learning and development** of your students.

C				D		
How important is doing this for my job satisfaction			*Please tick one of the columns (√) for each question opposite each statement.*	**How important is this for the learning of my students**		
very important	to some extent	of little importance		very important	to some extent	of little importance
			1. Plan lessons that are based on the differing abilities of students			
			2. Make learning experiences relevant to students' lives and concerns			
			3. Plan lessons with concern for sequence			
			4. Develop a warm, personal relationship with students			
			5. Use a variety of approaches to gain student interest			
			6. Build positive relationships between students			
			7. Communicate clear rules for student behaviour			
			8. Give prompt attention when issues of student behaviour arise			
			9. Clearly inform students of learning objectives			
			10. Clearly acknowledge the good work of individual students			

C				D		
How important is doing this for my job satisfaction			*Please tick one of the columns (√) for each question opposite each statement.*	**How important is this for the learning of my students**		
very important	to some extent	of little importance		very important	to some extent	of little importance
			11. Return students' work promptly			
			12. Give special attention to developing students' thinking skills			
			13. Give plenty of opportunities for individualised student work			
			14. Be accessible to students outside the classroom			
			15. Seek feedback from students			
			16. Give students feedback about their efforts to learn			
			17. Use a variety of approaches to gain student participation			

PART 6 ABOUT YOURSELF AND YOUR EXPERIENCE

Information about yourself

1. Are you *(please tick the appropriate box)* Female ☐

Male ☐

2. What Qualifications do you hold (e.g., Licencia en Biología) *(Please specify in the space below):*

---

3. What is your date of birth?(e.g. 17 March 1968)

---

4. How many people live in your home?

----------people

5. Approximately, what is your the average family income per month (total all types of income: salaries, pensions, income from other independent activity, etc.)

----------pesos

Information about your present job

6. Can you give more information about the schools in which you work at present?

(Please specify in the spaces below)

Name of school	**How many paid hours do you work there per week?**	**For how many years have worked at this school?**
1.----------	1.----------	1.----------
2.----------	2.----------	2.----------
3.----------	3.----------	3.----------

7. What is the title of your present post (e.g., Docente de aula y director/a técnico)

(Please specify in the space below).

---

8. What is the main subject that you teach *(Please specify in the space below).*

---

9. Please indicate if you completed studies to teach this subject *(Mark the appropriate square)*

Yes ☐

No ☐

10. What other subjects do you teach other than that mentioned in question 8 *(Please specify in the space below).*

---

11. How many job applications have you made in the last two years:

a) for jobs within teaching/ the educational area?

---

b) for jobs outside of teaching?

Thank you for your time and help in completing this questionnaire

APPENDIX 5 TEACHER QUESTIONNAIRE-SPANISH VERSION

ANTES DE CUMPLIR EL CUESTIONARIO, PODRÍA HACER LA TABLA SIGUIENTE:

Queremos que distinga entre su satisfacción/insatisfacción **respecto al trabajo** que tiene hoy en su colegio(s) y la satisfacción/insatisfacción que tiene **respecto a la carrera de enseñanza como profesión.**

¿Qué factores contribuyen a su **satisfacción** presente con **el trabajo** que tiene ahora?	¿Qué factores contribuyen a su **satisfacción** presente con **la carrera de enseñanza** como profesión?
1. ----------	1. ----------
2. ----------	2. ----------
3. ----------	3. ----------
4. ----------	4. ----------
5. ----------	5. ----------

¿Qué factores contribuyen a su **insatisfacción** presente con **el trabajo** que tiene ahora?	¿Qué factores contribuyen a su **insatisfacción** presente con **la carrera de enseñanza** como profesión?
1.----------	1.----------
2.----------	2.----------
3.----------	3.----------
4.----------	4.----------
5.----------	5.----------

SATISFACCIÓN EN EL TRABAJO DE LA ENSEÑANZA

Un cuestionario para profesores/as de Ciencias en la escuela secundaria

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EL ESTUDIO

Esta investigación espera poder identificar cuáles son las factores que continúan contribuyendo a la satisfacción de los profesores/as en la enseñanza y cuáles les generan problemas al tratar de obtener reconocimiento profesional.

Para responder a estas preguntas queremos consultar a profesores de colegios subsidiados de Enseñanza Media en la IV región.

No creemos que las respuestas sean de ninguna manera obvias, por eso al final del proyecto compartiremos los resultados con todos los colegios participantes.

EL CUESTIONARIO

Este cuestionario consiste de seis partes. La Parte 1 contiene algunas preguntas acerca de su carrera en la enseñanza; La Parte 2 hace preguntas sobre su satisfacción general con su trabajo actual; La Parte 3 acerca de las condiciones de su trabajo; La Parte 4 de sus roles y responsabilidades; La Parte 5 de aspectos de la práctica en la sala de clase; y, finalmente La Parte 6 de algunos detalles personales.

TODA LA INFORMACIÓN QUE USTED SUMINISTRE SERÁ TRATADA DE UNA MANERA ESTRICTAMENTE CONFIDENCIAL

CUANDO USTED HAYA COMPLETADO ESTE CUESTIONARIO, por favor regrésalo a ----------antes que del----------

.

Si tiene alguna pregunta sobre este cuestionario, por favor póngase en contacto con Sarah Hean, Tel:214550/204461

Parte I MI CARRERA EN LA ENSEÑANZA

En esta sección hacemos algunas preguntas sobre su satisfacción general con la enseñanza y sobre los patrones de su carrera.

1. ¿En general, cuánto disfruta de la enseñanza como una ocupación ? (*Por favor marque su respuesta con un círculo)*

bastante hasta cierto punto no mucho muy poco

2. ¿En general, es la enseñanza EL TIPO DE TRABAJO QUE USTED QUERÍA cuando entró en la profesión ? (*Por favor marque su respuesta con un círculo)*

bastante hasta cierto punto no mucho muy poco

3. ¿Sabiendo lo que sabe ahora, y si tuviera que decidir de nuevo si entrar o no en la profesión, qué tan probable es que lo haría ? (*Por favor marque su respuesta con un círculo)*

bastante hasta cierto punto no mucho muy poco

4. ¿Puede cumplir usted sus metas de trabajo en la profesión de la enseñanza? (*Por favor marque su respuesta con un círculo)*

bastante hasta cierto punto no mucho muy poco

5. ¿Durante cuántos años ha trabajado usted como profesor/a ? (*Por favor indique el número completo)*----------años

PARTE 2 LA EXPERIENCIA DEL TRABAJO

En esta sección general hacemos algunas preguntas acerca de su nivel de satisfacción en su trabajo actual

1. ¿Considerando todas las cosas y pensando en el puesto de trabajo que ahora tiene, qué tan satisfecho/a está con su trabajo actual? (*Por favor marque su respuesta con un círculo)*

bastante hasta cierto punto no mucho muy poco

2. ¿Qué tan satisfecho/a está con la calidad general de su presente trabajo? (*Por favor marque su respuesta con un círculo)*

bastante hasta cierto punto no mucho muy poco

PARTE 3 CONDICIONES DE MI TRABAJO

Nos gustaría que usted pensara en **sus condiciones de trabajo** y en cómo **usted percibe** el impacto que éstas condiciones tienen **en su satisfacción con el trabajo.**

Debajo hay una lista de afirmaciones que describen las posibilidades. Hay dos preguntas, **A y B,** para cada afirmación.

A pregunta **hasta qué punto** cada condición **está presente** en su trabajo.
B pregunta **qué tan importante** es cada condición para su satisfacción con el trabajo **sin importar qué tanto está presente.**

Un ejemplo de cómo completar las columnas A y B es dado en la pregunta 1

A **B**

¿Qué tanto está presente esta condición en su trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	**¿Qué tan importante es esto para mi satisfacción con el trabajo?**		
la mayoría del tiempo	**una parte del tiempo**	**una pequeña parte del tiempo**	**MI SITUACIÓN DE TRABAJO**	**muy importante**	**hasta cierto punto**	**de poca importancia**
	√		**1.** ***Me gusta mi trabajo***	√		
			2. Tengo libertad para decidir cómo trabajo			
			3. El tamaño de mis clases es razonable			
			4. La enseñanza me da la oportunidad de usar diversas destrezas			
			5. Mi asignatura es fácil de enseñar			
			6. Enseñar es un trabajo interesante			
			7. Tengo control sobre las metas de mi enseñanza			
			8. La enseñanza estimula mi creatividad			

A B

¿Qué tanto está presente esta condición en su trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	¿Qué tan importante es esto para mi satisfacción con el trabajo?		
la mayoría del tiempo	una parte del tiempo	una pequeña parte del tiempo	**MI SITUACIÓN DE TRABAJO**	muy importante	hasta cierto punto	de poca importancia
			9. La asignatura que enseño es intelectualmente estimulante			
			10. Tengo un buen dominio del contenido de la asignatura que enseño			
			11. Planificar mis clases diarias es mi responsabilidad			
			12. Hay actividades muy interesantes en la enseñanza de mi asignatura			
			13. La enseñanza de mi asignatura estimula la originalidad			
			14. Mis responsabilidades están claramente definidas			
			15. Mi enseñanza está libre de interrupciones externas			
			16. La cantidad de trabajo escolar que tengo que hacer en casa es razonable			
			17. Tengo a mi disposición los materiales adecuados para mi trabajo			
			18. Encuentro consejo fácilmente si lo necesito			
			19. El entorno físico de mi trabajo es placentero			
			20. La cantidad de trabajo administrativo que tengo que hacer es razonable			

A				B		
¿Qué tanto está presente esta condición en su trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	**¿Qué tan importante es esto para mi satisfacción con el trabajo?**		
la mayoría del tiempo	**una parte del tiempo**	**una pequeña parte del tiempo**	**MI SITUACIÓN DE TRABAJO**	**muy importante**	**hasta cierto punto**	**de poca importancia**
			21. Las prácticas educativas que impulse la actual reforma tienen suficiente oportunidad de desarrollarse en este colegio			
			22. El trabajo que hago es reconocido			
			23. Existen oportunidades para participar en cursos que puedan beneficiar mi trabajo de enseñanza en el colegio			
			24. Tengo acceso a facilidades de computación			
			25. El tiempo que demoro en llegar al trabajo es razonable			
			26. La cantidad de trabajo que tengo en el colegio es razonable			
			27. Tengo la oportunidad de participar en el desarrollo de políticas educativas para el colegio			
			28. Soy personalmente responsable por los resultados de mi enseñanza			
			29. Entiendo los métodos de instrucción que implemento en mi enseñanza			
			30. Tengo suficiente equipo de laboratorio para enseñar mi asignatura			

A B

¿Qué tanto está presente esta condición en su trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	¿Qué tan importante es esto para mi satisfacción con el trabajo?		
la mayoría del tiempo	una parte del tiempo	una pequeña parte del tiempo	**MI SITUACIÓN DE TRABAJO**	muy importante	hasta cierto punto	de poca importancia
			31. Me gusta enseñar mi asignatura a mis estudiantes			
			32. Me siento estimulado/a para experimentar con diferentes métodos de enseñanza			
			33. Tengo un horario adecuado			
			34. Tengo la libertad para decidir metodología en la asignatura			
			35. Tengo las condiciones adecuadas dentro de la sala para desarrollar las actividades planificadas.			

A B

¿Qué tanto está presente esta condición en su trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	¿Qué tan importante es esto para mi satisfacción con el trabajo?		
la mayoría del tiempo	una parte del tiempo	una pequeña parte del tiempo	**OTROS EN MI COLEGIO**	muy importante	hasta cierto punto	de poca importancia
			1. Tengo estudiantes muy participativos en mis clases			
			2. Tengo el apoyo y la cooperación de colegas			
			3. Tengo apoyo adecuado del personal no docente			
			4. Tengo la oportunidad de interactuar profesionalmente con otros colegas			
			5. Las reuniones con colegas son valiosas			
			6. Me gustan los colegas con los que trabajo			
			7. Mi superior inmediato me colabora en mi trabajo			
			8. El Director/a tiene éxito en estimular el trabajo en grupo			
			9. Las políticas del colegio se implementan de una manera consistente			
			10. En mi colegio la moral del personal es generalmente buena			
			11. El nivel de repetición de los estudiantes es razonable			
			12. El nivel de ausentismo de los estudiantes es razonable			

A B

¿Qué tanto está presente esta condición en su trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	¿Qué tan importante es esto para mi satisfacción con el trabajo?		
la mayoría del tiempo	una parte del tiempo	una pequeña parte del tiempo	**OTROS EN MI COLEGIO**	muy importante	hasta cierto punto	de poca importancia
			13. Mis estudiantes me respetan como profesor/a			
			14. La actitud de los estudiantes ante mi asignatura es buena			
			15. El desempeño de los estudiantes en mi asignatura es bueno			

A				B		
¿Qué tanto está presente esta condición en su trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	**¿Qué tan importante es esto para mi satisfacción con el trabajo?**		
la mayoría del tiempo	**una parte del tiempo**	**una pequeña parte del tiempo**	**PADRES Y COMUNIDAD**	**muy importante**	**hasta cierto punto**	**de poca importancia**
			1. Recibo apoyo de parte de los padres de mis estudiantes			
			2. Los profesores/as son respetados en esta comunidad			
			3. Hay buen contacto entre el colegio y los grupos locales en la comunidad			
			4. Las autoridades municipales prestan apoyo y colaboración			
			5. Los problemas entre el colegio y la comunidad son manejados constructivamente			
			RECOMPENSAS PROFESIONALES			
			1. La seguridad de trabajo es buena			
			2. El salario es bueno			
			3. Los beneficios materiales de trabajo, además de mi salario, son buenos			
			4. El salario de un profesor/a es suficiente para vivir			
			5. Las oportunidades de ascenso en este colegio son adecuadas			
			6. Los ascensos en este colegio son manejados de manera justa			
			7. El número de días de vacaciones es adecuado			
			8. Tengo una adecuada carga horario			

1. ¿Qué otros factores, que no se mencionan arriba, contribuyen a su satisfacción o insatisfacción con su situación de trabajo? . Indique con cual tiene satisfacción y con cuales siente insatisfacción *(Por favor especifique en el espacio debajo)*

_____

_____

_____

_____

_____

_____

_____

_____

_____

2. ¿Piensa usted que su nivel de satisfacción con el trabajo afecta las ACTITUDES de los estudiantes hacia la asignatura de Ciencias que usted enseña? ***(Por favor marque el cuadro apropiado)***

Sí ☐

No ☐

Explique la razón ***(Por favor especifique en el espacio debajo)***

3. ¿Piensa usted que el nivel de satisfacción con su trabajo afecta los LOGROS de sus estudiantes en la asignatura de Ciencias que enseña? (*Por favor marque el cuadro apropiado)*

Sí ☐

No ☐

Explique la razón *(Por favor especifique en el espacio debajo)*

_____

_____

_____

_____

PARTE 4: MIS ROLES Y RESPONSABILIDADES

Nos gustaría que usted pensara en las responsabilidades generales que tiene en su presente trabajo y en cómo percibe usted la influencia de éstas en **su satisfacción con el trabajo.**

Más abajo hay una lista de afirmaciones que describen varios roles y responsabilidades.

Hay dos columnas para marcar. Bajo **A** se le pide que diga **cuánto hace ciertas cosas** como parte de su trabajo; Bajo **B**, se le pide que indique **qué tan importante es tomar parte en** cada una, para su satisfacción en el trabajo.

A **B**

¿Cuánto hago esto?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	**Qué tan importante es esto para su satisfacción con el trabajo**		
Mucho	**hasta cierto punto**	**Poco**	**COMPARTO LA RESPONSABILIDAD DE LA ADMINISTRACIÓN.....**	**muy importante**	**hasta cierto punto**	**de poca importancia**
			1. en la gerencia del colegio			
			2. en mi departamento			
			3. en el sistema de orientación estudiantil			
			ESTOY INVOLUCRADO/A EN....			
			1. iniciar contacto con los padres			
			2. supervisar estudiantes en práctica profesional pedagógica			
			3. apoyar a los profesores/as que recién comenzaron en este colegio en marzo.			
			4. relacionar entre la comunidad y el colegio			
			5. Aconsejar a los estudiantes			

A B

¿Cuánto hago esto?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	Qué tan importante es esto para su satisfacción con el trabajo		
mucho	hasta cierto punto	poco	**TRABAJO CON COLEGAS EN .....**	muy importante	hasta cierto punto	de poca importancia
			1. desarrollo curricular			
			2. evaluación del progreso de los estudiantes			
			3. el bienestar de los estudiantes			
			PARTICIPO EN OTRAS ACTIVIDADES			
			1. deportes, drama, viajes etc.			
			2. estudio para desarrollarme profesionalmente			
			3. participo en actividades de investigación			
			4. asisto a conferencias			
			5. soy parte de alguna asociación de educadores/as de mi área			
			6. asisto a reuniones de carácter gremial de profesores/as			
			7. leo periódicos o revistas relacionados con mi profesión			

PARTE 5 MI PRÁCTICA EN LA SALA DE CLASE

En esta sección nos gustaría que usted pensara en ciertos aspectos de su **propia enseñanza.** En las páginas 10 y11 hemos listado algunas prácticas dentro de la sala de clase y **las mismas** han sido repetidas en las páginas 12 y 13.

Esta vez, le pedimos que ponga una marca frente a cada número debajo de las columnas **A** y **B** en las páginas 10 y 11 y las columnas **C** y **D** en las páginas 12 y 13..

A pregunta **qué tan difícil es** hacer cada práctica

B pregunta **qué tanto hace** esta práctica

A B

¿Qué tan difícil es hacer esto en la práctica?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	¿Cuánto hago esto en mi enseñanza?		
no es difícil	bastante difícil	difícil		casi todo el tiempo	una parte del tiempo	una pequeña parte del tiempo
			1. Planes de clase que estén basados en las diversas habilidades de los estudiantes			
			2. Hacer la experiencia del aprendizaje relevante para las vidas y preocupaciones de los estudiantes			
			3. Planes de clase que siguen una secuencia			
			4. Desarrollar una relación cálida y cercana con los estudiantes			
			5. Usar una variedad de acercamientos para atraer el interés de los estudiantes			
			6. Construir relaciones positivas entre los estudiantes			
			7. Comunicar reglas claras para el comportamiento de los estudiantes			

A				B		
¿Qué tan difícil es hacer esto en la práctica?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	**¿Cuánto hago esto en mi enseñanza?**		
no es difícil	**bastante difícil**	**difícil**		**casi todo el tiempo**	**una parte del tiempo**	**una pequeña parte del tiempo**
			8. Dar atención rápida a problemas que se presenten con el comportamiento de los estudiantes			
			9. Informar a los estudiantes claramente sobre los objetivos del aprendizaje			
			10. Reconocer claramente el buen trabajo de estudiantes individuales			
			11. Devolver rápidamente los trabajos de los estudiantes			
			12. Prestar especial atención a desarrollar las capacidades de pensamiento de los estudiantes			
			13. Dar muchas oportunidades para que los estudiantes puedan desarrollar su trabajo de manera individual			
			14. Ser accesible a los estudiantes fuera de la clase			
			15. Pedir a los estudiantes sus comentarios sobre el proceso de enseñanza			
			16. Dar a los estudiantes comentarios respecto a su proceso de aprendizaje			
			17. Usar una variedad de acercamientos para conseguir la participación de los estudiantes			

Aquí está la **misma lista** de cosas con dos preguntas diferentes.

Por favor ponga una marca debajo de las columnas **C y D**

C pregunta **qué tan importante** es cada práctica para su satisfacción con el trabajo.
D pregunta **qué tan importante es cada práctica para el proceso de desarrollo y aprendizaje de** sus estudiantes.

C				D		
¿Qué tan importante es hacer esto para mi satisfacción con el trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	**¿Qué tan importante es esto para el aprendizaje de mis estudiantes?**		
muy importante	**hasta cierto punto**	**de poca importancia**		**muy importante**	**hasta cierto punto**	**de poca importancia**
			1. Planes de clase que estén basados en las diversas habilidades de los estudiantes			
			2. Hacer la experiencia del aprendizaje relevante para las vidas y preocupaciones de los estudiantes			
			3. Planes de clase que siguen una secuencia			
			4. Desarrollar una relación cálida y cercana con los estudiantes			
			5. Usar una variedad de acercamientos para atraer el interés de los estudiantes			
			6. Construir relaciones positivas entre los estudiantes			
			7. Comunicar reglas claras para el comportamiento de los estudiantes			

C D

¿Qué tan importante es hacer esto para mi satisfacción con el trabajo?			*Por favor marque una de las columnas(√) para cada pregunta frente a cada afirmación.*	¿Qué tan importante es esto para el aprendizaje de mis estudiantes?		
muy importante	hasta cierto punto	de poca importancia		muy importante	hasta cierto punto	de poca importancia
			8. Dar atención rápida a problemas que se presenten con el comportamiento de los estudiantes			
			9. Informar a los estudiantes claramente sobre los objetivos del aprendizaje			
			10. Reconocer claramente el buen trabajo de estudiantes individuales			
			11. Devolver rápidamente los trabajos de los estudiantes			
			12. Prestar especial atención a desarrollar las capacidades de pensamiento de los estudiantes			
			13. Dar muchas oportunidades para que los estudiantes puedan desarrollar su trabajo de manera individual			
			14. Ser accesible a los estudiantes fuera de la clase			
			15. Pedir a los estudiantes sus comentarios sobre el proceso de enseñanza			
			16. Dar a los estudiantes comentarios respecto a su proceso de aprendizaje			
			17. Usar una variedad de acercamientos para conseguir la participación de los estudiantes			

PARTE 6 SOBRE USTED Y SU EXPERIENCIA

Información sobre usted

1. Es usted *(Por favor marque el cuadro apropiado)*

Mujer ☐

Hombre ☐

2. ¿Qué títulos tiene? (ej, Licencia en Biología)*(Por favor especifique en el espacio debajo)*

---

3. ¿Cuál es su fecha de nacimiento? *(ejemplo 17 de Marzo 1968)*

---

4 .¿Cuántas personas viven en su casa?

----------personas

5. ¿Aproximadamente, cuánto dinero reúne el grupo familiar al mes (sumando todos los tipos de ingreso: sueldos, pensiones, ingresos por actividad independiente, etc.)?

----------pesos

Información sobre su TRABAJO ACTUAL

6. Podría dar mas información sobre los colegios en que trabaja ahora? ***(Por favor especifique en los espacios abajos).***

Nombre de colegio	¿Cuántos horas pagadas tiene usted allí cada semana?	¿Durante cuanto años ha enseñado usted en este colegio?
1.----------	1.----------	1.----------
2.----------	2.----------	2.----------
3.----------	3.----------	3.----------

7. Título de su puesto/s presente (ej. Docente de aula y director/a técnico*(Por favor especifique en el espacio debajo)*

---

8. Asignatura principal que enseña *(Por favor especifique en el espacio debajo*

---

9. Por favor indique si usted hizo estudios para enseñar esta asignatura *(Marque el cuadro apropiado)*

Sí ☐

No ☐

10. ¿Qué otras asignaturas enseña usted además de la mencionada en la pregunta 8?*(Por favor especifique en el espacio*).

---

11. ¿Cuántas veces ha buscado trabajo en los 2 últimos años? ***(Por favor especifique en los espacios abajos)***

(a) En otro trabajo de enseñanza/o en el área educativa

(b) En un trabajo fuera de la enseñanza?

♣ Gracias por su tiempo y ayuda para completar este cuestionario ♣

APPENDIX 6 SCALE ALLOCATION OF ITEMS IN TEACHER QUESTIONNAIRE AND PERCENTAGE RESPONSES

Table A6.01: Overall job satisfaction

Item 1: In general, how much do you enjoy teaching as an occupation?		**Item 4: How able are you to meet your work life goals in a teaching job?**	
	Percentage of teachers responding per category		*Percentage of teachers responding per category*
1 (%)	76	1 (%)	23
0.5 (%)	22	0.5 (%)	64
0 (%)	2	0 (%)	14
Mean	0.87	Mean	0.55
SD	0.25	SD	0.30
Valid N	45	Valid N	44
Missing (%)	0.0	Missing (%)	2.20
Item 2: In general, how well would you say that teaching measures up to the sort of work you WANTED when you entered the profession?		**Item 5: Considering all things, and thinking now about the teaching post you presently hold, how satisfied would you say you are with your present job?**	
	Percentage of teachers responding per category		*Percentage of teachers responding per category*
1 (%)	56	1 (%)	47
0.5 (%)	38	0.5 (%)	49
0 (%)	7	0 (%)	4
Mean	0.7	Mean	0.7
SD	0.3	SD	0.3
Valid N	45	Valid N	45
Missing (%)	0.0	Missing (%)	0.0
Item 3: Knowing what you know now, if you had to decide all over again whether to enter teaching, how likely is it that you would so?		**Item 6: How satisfied are you with the overall quality of your work life?**	
	Percentage of teachers responding per category		*Percentage of teachers responding per category*
1 (%)	34	1 (%)	40
0.5 (%)	39	0.5 (%)	53
0 (%)	27	0 (%)	7
Mean	0.5	Mean	0.7
SD	0.4	SD	0.3
Valid N	44	Valid N	45
Missing (%)	2.2	Missing (%)	0.0

Table A6.02: Relationship with colleagues

Item1: I have the support and co-operation of colleagues			**Item 4: I can easily get advice and consultation when I need help**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	38	72	1 (%)	40	66
0.5 (%)	45	21	0.5 (%)	37	25
0 (%)	17	7	0 (%)	23	9
Mean	0.6	0.8	Mean	0.6	0.8
SD	0.4	0.3	SD	0.4	0.3
Valid N	42	43	Valid N	43	44
Missing (%)	6.7	4.4	Missing (%)	4.4	2.2
Item 2: I have adequate help from support staff			**Item 5: Meetings with colleagues are valuable**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	42	64	1 (%)	42	72
0.5 (%)	42	30	0.5 (%)	44	23
0 (%)	16	7	0 (%)	14	5
Mean	0.6	0.8	Mean	0.6	0.8
SD	0.4	0.3	SD	0.4	0.3
Valid N	43	44	Valid N	43	43
Missing (%)	4.4	2.2	Missing (%)	4.4	4.4
Item 3: I have opportunity for professional interaction with other colleagues			**Item 6: I like the people I work with**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	41	75	1 (%)	73	82
0.5 (%)	30	21	0.5 (%)	25	14
0 (%)	30	5	0 (%)	2	5
Mean	0.6	0.9	Mean	0.85	0.9
SD	0.4	0.3	SD	0.26	0.3
Valid N	44	44	Valid N	44	44
Missing (%)	2.2	2.2	Missing (%)	2.2	2.2

Table A6.03: Management and morale

Item 1: My immediate superior is helpful to me in my work			Item 3: School policies are carried out in a consistent way		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	65	88	1 (%)	48	84
0.5 (%)	21	7	0.5 (%)	36	14
0 (%)	14	5	0 (%)	17	2
Mean	0.8	0.9	Mean	0.7	0.9
SD	0.4	0.2	SD	0.4	0.2
Valid N	43	43	Valid N	42	43
Missing (%)	4.4	4.4	Missing (%)	6.7	4.4

Item 2: My Head (Director) is successful in getting people to work together			Item 4: In my school, staff morale is generally good		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	51	73	1 (%)	77	81
0.5 (%)	34	25	0.5 (%)	19	19
0 (%)	15	3	0 (%)	5	0
Mean	0.7	0.9	Mean	0.9	0.9
SD	0.4	0.3	SD	0.3	0.2
Valid N	41	40	Valid N	43	43
Missing (%)	8.9	11.1	Missing (%)	4.4	4.4

Table A6.04: Community/school relationships

Item 1: The parents of my pupils are supportive			**Item 3: School-community problems are constructively handled**		
	Presence	*Importance*		*Presence*	*Importance*
1.0 (%)	11	71	1.0 (%)	54	70
0.5 (%)	47	24	0.5 (%)	37	23
0.0 (%)	42	4	0.0 (%)	9	7
Mean	0.3	0.8	Mean	0.7	0.8
SD	0.3	0.3	SD	0.3	0.3
Valid N	45	45	Valid N	43	43
Missing (%)	0.0	0.0	Missing (%)	4.4	4.4
Item 2: There is good contact between school and local groups			**Item 4: Teachers in this community are regarded with respect**		
	Presence	*Importance*		*Presence*	*Importance*
1.0 (%)	30	58	1.0 (%)	67	96
0.5 (%)	37	40	0.5 (%)	23	2
0.0 (%)	33	2	0.0 (%)	9	2
Mean	0.5	0.8	Mean	0.8	1.0
SD	0.4	0.3	SD	0.3	0.2
Valid N	43	45	Valid N	43	44
Missing (%)	4.4	0.0	Missing (%)	4.4	2.2

Table A6.05: Career (professional) advancement

Item 1: Promotion opportunities are adequate			**Item 3: I have enough recognition of the work I do**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	10	74	1 (%)	40	89
0.5 (%)	38	23	0.5 (%)	40	11
0 (%)	52	2	0 (%)	26	0
Mean	0.3	0.9	Mean	0.6	0.9
SD	0.3	0.3	SD	0.4	0.2
Valid N	42	43	Valid N	43	45
Missing (%)	6.7	4.4	Missing (%)	4.4	0.0
Item 2: Promotions are fairly handled					
	Presence	*Importance*			
1 (%)	36	80			
0.5 (%)	28	10			
0 (%)	26	0			
Mean	0.5	0.9			
SD	0.4	0.3			
Valid N	36	40			
Missing (%)	20.0	11.1			

Table A6.06: Administrative responsibility

Item 1: I share responsibility for administration in school management.			**Item 5: I am involved in the induction of new teachers.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	0	26	1 (%)	28	57
0.5 (%)	25	41	0.5 (%)	44	30
0 (%)	75	33	0 (%)	28	14
Mean	0.1	0.5	Mean	0.5	0.7
SD	0.2	0.4	SD	0.4	0.4
Valid N	36	39	Valid N	36	37
Missing (%)	20	13.3	Missing (%)	20.0	17.8
Item 2: I share responsibility for administration in the pastoral/guidance system.			**Item 6: I am involved in work on school/community relationships**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	33	59	1 (%)	18	46
0.5 (%)	41	37	0.5 (%)	41	41
0 (%)	26	5	0 (%)	41	13
Mean	0.5	0.8	Mean	0.4	0.7
SD	0.4	0.3	SD	0.4	0.4
Valid N	42	41	Valid N	39	39
Missing (%)	6.7	8.9	Missing (%)	13.3	13.3
Item 3: I am involved in initiating parental contacts.			**Item 7: I am involved in the running of clubs, sport, drama, trips, etc.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	46	74	1 (%)	25	46
0.5 (%)	26	23	0.5 (%)	17	27
0 (%)	28	3	0 (%)	58	27
Mean	0.6	0.9	Mean	0.3	0.6
SD	0.4	0.3	SD	0.4	0.4
Valid N	39	39	Valid N	36	37
Missing (%)	13.3	13.	Missing (%)	20.0	17.8
Item 4: I am involved in the supervision of student teaching.					
	Presence	*Importance*			
1 (%)	30	35			
0.5 (%)	19	41			
0 (%)	51	24			
Mean	0.4	0.6			
SD	0.4	0.4			
Valid N	37	37			
Missing (%)	17.8	17.8			

Table A6.07: Personal and professional development

Item 1: I participate in study for professional development.			**Item 4: I attend teaching subject associations.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	59	91	1 (%)	14	49
0.5 (%)	32	7	0.5 (%)	24	32
0 (%)	9	2	0 (%)	62	19
Mean	0.8	0.9	Mean	0.3	0.7
SD	0.3	0.2	SD	0.4	0.4
Valid N	44	44	Valid N	37	37
Missing (%)	2.2	2.2	Missing (%)	17.8	17.8
Item 2: I participate in research activities.			**Item 5: I read professional periodicals.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	13	70	1 (%)	57	84
0.5 (%)	36	28	0.5 (%)	32	16
0 (%)	51	3	0 (%)	11	0
Mean	0.3	0.8	Mean	0.7	0.9
SD	0.4	0.3	SD	0.4	0.2
Valid N	39	40	Valid N	44	45
Missing (%)	13.3	11.1	Missing (%)	2.2	0.0
Item 3: I attend national/regional conferences.					
	Presence	*Importance*			
1 (%)	16	73			
0.5 (%)	33	22			
0 (%)	51	5			
Mean	0.33	0.8			
SD	0.38	0.3			
Valid N	43	41			
Missing (%)	4.4	8.9			

Table A6.08: Student characteristics

Item 1: I have responsive pupils in my class			Item 4: Student achievement in my subject is good		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	11	89	1 (%)	42	91
0.5 (%)	59	11	0.5 (%)	54	9
0 (%)	30	0	0 (%)	5	0
Mean	0.4	0.9	Mean	0.7	1.0
SD	0.3	0.2	SD	0.3	0.2
Valid N	44	44	Valid N	43	43
Missing (%)	2.2	2.2	Missing (%)	4.4	4.4
Item 2: Students have a good attitude towards my subject			**Item 5: The level of student repetition is reasonable**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	61	93	1 (%)	57	74
0.5 (%)	33	7	0.5 (%)	29	21
0 (%)	7	0	0 (%)	14	5
Mean	0.8	1.0	Mean	0.7	0.9
SD	0.3	0.1	SD	0.4	0.3
Valid N	43	44	Valid N	42	43
Missing (%)	4.4	2.2	Missing (%)	6.7	4.4
Item 3: The level of student absenteeism is reasonable			**Item 6: My students respect me as a teacher**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	42	71	1 (%)	91	92
0.5 (%)	30	27	0.5 (%)	9	2
0 (%)	28	2	0 (%)	0	0
Mean	0.6	0.8	Mean	0.95	1.0
SD	0.4	0.3	SD	0.15	0.1
Valid N	43	44	Valid N	43	44
Missing (%)	4.4	2.2	Missing (%)	4.4	2.2

Table A6.09: Work content

Item 1: The subject I teach is intellectually stimulating.			Item 3: Teaching encourages me to be creative.		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	73	82	1 (%)	73	84
0.5 (%)	23	16	0.5 (%)	27	16
0 (%)	5	2	0 (%)	0	0
Mean	0.8	0.9	Mean	0.9	0.9
SD	0.3	0.2	SD	0.2	0.2
Valid N	44	45	Valid N	44	45
Missing (%)	2.2	0.0	Missing (%)	2.2	0.0
Item 2: There are absorbing, engrossing activities in teaching.			**Item 4: Teaching is interesting work.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	59	84	1 (%)	91	91
0.5 (%)	39	16	0.5 (%)	9	9
0 (%)	2	0	0 (%)	0	0
Mean	0.8	0.9	Mean	1.0	1.0
SD	0.3	0.2	SD	0.2	0.1
Valid N	44	44	Valid N	44	45
Missing (%)	2.2	2.2	Missing (%)	2.2	0.0

Table A6.10: Responsibility for pupil progress

Item 1: I share responsibility for administration in subject department			**Item 4: I work with colleagues on evaluating pupil progress**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	37	64	1 (%)	18	63
0.5 (%)	51	33	0.5 (%)	43	30
0 (%)	12	2	0 (%)	40	8
Mean	0.6	0.8	Mean	0.7	0.9
SD	0.3	0.3	SD	0.4	0.2
Valid N	43	42	Valid N	41	41
Missing (%)	4.4	6.7	Missing (%)	8.9	8.9
Item 2: I am involved in counselling individual pupils			**Item 5: I work with colleagues on the welfare of pupil**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	79	86	1 (%)	45	80
0.5 (%)	19	14	0.5 (%)	35	20
0 (%)	2	0	0 (%)	20	0
Mean	0.9	0.9	Mean	0.6	0.9
SD	0.2	0.2	SD	0.4	0.2
Valid N	42	42	Valid N	40	40
Missing (%)	6.7	6.7	Missing (%)	11.1	11.1
Item 3: I work with colleagues on curriculum development					
	Presence	*Importance*			
1 (%)	49	88			
0.5 (%)	37	10			
0 (%)	15	2			
Mean	0.4	0.8			
SD	0.4	0.3			
Valid N	40	40			
Missing (%)	11.1	11.1			

Table A6.11: Material rewards

Item 1: Pay is good			**Item 4: A teacher's income is enough to live on.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	9	84	1 (%)	5	88
0.5 (%)	44	14	0.5 (%)	29	10
0 (%)	47	2	0 (%)	67	2
Mean	0.3	0.9	Mean	0.2	0.9
SD	0.3	0.2	SD	0.3	0.2
Valid N	43	44	Valid N	42	42
Missing (%)	4.4	2.2	Missing (%)	6.7	6.7
Item 2: Job benefits, in addition, to my salary, are good.			**Item 5: The provision of vacation time is good.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	13	77	1 (%)	93	96
0.5 (%)	45	19	0.5 (%)	5	0
0 (%)	43	5	0 (%)	2	4
Mean	0.4	0.9	Mean	1.0	1.0
SD	0.3	0.3	SD	0.2	0.2
Valid N	40	43	Valid N	43	45
Missing (%)	11.1	4.4	Missing (%)	4.4	0.0
Item 3: Job security is good.			**Item 6: I have sufficient working hours.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	71	91	1 (%)	64	88
0.5 (%)	18	4	0.5 (%)	25	9
0 (%)	11	4	0 (%)	11	2
Mean	0.8	0.9	Mean	0.8	0.9
SD	0.4	0.2	SD	0.4	0.2
Valid N	44	45	Valid N	44	43
Missing (%)	2.2	0.0	Missing (%)	2.2	4.4

Table A6.12: Workload

Item 1: The amount of schoolwork I need to do at home is reasonable.			**Item 3: The size of my class is reasonable.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	30	68	1 (%)	21	74
0.5 (%)	44	30	0.5 (%)	42	26
0 (%)	26	2	0 (%)	37	0
Mean	0.5	0.8	Mean	0.6	0.9
SD	0.4	0.3	SD	0.4	0.2
Valid N	43	44	Valid N	43	43
Missing (%)	4.4	2.2	Missing (%)	4.4	4.4
Item 2: The amount of clerical/ administrative work I have to do is reasonable to me.			**Item 4: The amount of work at school is reasonable to me.**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	34	49	1 (%)	49	77
0.5 (%)	55	40	0.5 (%)	44	23
0 (%)	11	11	0 (%)	7	0
Mean	0.6	0.7	Mean	0.7	0.9
SD	0.3	0.3	SD	0.3	0.2
Valid N	44	45	Valid N	43	44
Missing (%)	2.2	0.0	Missing (%)	4.4	2.2

Table A6.13: Physical working conditions

Item 1: I have access to computer facilities			**Item 4: I have materials/equipment for my work**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	48	71	1 (%)	34	84
0.5 (%)	32	27	0.5 (%)	30	13
0 (%)	20	2	0 (%)	36	2
Mean	0.6	0.8	Mean	0.5	0.9
SD	0.4	0.3	SD	0.4	0.2
Valid N	44	45	Valid N	44	45
Missing (%)	2.2	0.0	Missing (%)	2.2	0.0
Item 2: I have laboratory equipment.			**Item 5: My classroom teaching is free from interruption**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	25	80	1 (%)	22	58
0.5 (%)	30	21	0.5 (%)	62	40
0 (%)	46	0	0 (%)	16	2
Mean	0.4	0.9	Mean	0.53	0.8
SD	0.4	0.2	SD	0.31	0.3
Valid N	44	44	Valid N	45	45
Missing (%)	2.2	2.2	Missing (%)	0.0	0.0
Item 3: The physical surroundings of my work are pleasant			**Item 6: I have adequate conditions inside the classroom to develop planned activities**		
	Presence	*Importance*		*Presence*	*Importance*
1 (%)	59	78	1 (%)	46	91
0.5 (%)	27	18	0.5 (%)	39	7
0 (%)	14	5	0 (%)	16	2
Mean	0.7	0.9	Mean	0.7	0.9
SD	0.4	0.3	SD	0.4	0.2
Valid N	44	45	Valid N	44	44
Missing (%)	2.2	0.0	Missing (%)	2.2	2.2

APPENDIX 7 ACHIEVEMENT TEST-ENGLISH VERSION

TEST OF SCIENCE

UNIVERSITAND OF BRISTOL
BRISTOL
UNITED KINGDOM

UNIVERSITAND OF LA SERENA
LA SERENA
CHILE

READ CAREFULLAND THE INSTRUCTIONS THAT FOLLOW BEFORE OPENING THE TEST PAPER

You have received along with this test paper an ANSWER SHEET. The test paper contains questions that you must read carefully before you answer. Do **not** use it to write on when making the calculations you feel necessary. The answer to each question must **only** be marked on the ANSWER SHEET.

Before answering the test complete the personal details asked of you on the answer sheet: name, date of birth, school and the number of years that you have been taught by your Biology, Chemistry and Physics teacher respectively.

The test contains 45 questions. Each question has FOUR possible ANSWERS or OPTIONS, identified by the letters A, B, C, D but **only one of these** is correct.

In the selection of answers given in the ANSWER SHEET you will find a series of numbers arranged in three columns. Each number corresponds to the number of the corresponding question in the test paper. On the right of each number you will find four squares with the letters A, B, C, D that correspond to the choices available to the question in test paper.

To answer, **you must read** with care each question and **choose** the **correct** answer. After you have done this identify on the ANSWER SHEET the number of the question that you are about to answer and colour in the square that corresponds to the answer that you have chosen.

Example

80. In photosynthesis one of the following are produced:

A) carbon dioxide

B) oxygen

C) nitrogen

D) water

79.	A ☐	B ☐	C ☐	D ☐
80.	A ☐	B ■	C ☐	D ☐
81.	A ☐	B ☐	C ☐	D ☐

If you analyse the question you will note that the correct answer is B. Therefore, you need to find on the ANSWER SHEET the number that corresponds to the question that you are answering and with your pencil fill in the square that corresponds to the letter that you have chosen as correct

When answering each question you must fill in **only one of the squares.** Try not to make corrections where possible but if necessary erase the answer completely with an adequate eraser. If you do not have an eraser ask for one from your examiner.

Work quickly and accurately. If you find any questions difficult, carry on with those that follow and at the end of you have any time left over go back to those you have not answered and try to do them. Try not to guess and answer what you know.

ANSWER SHEET

Name.....
Date of birth:.....
School:.....

Years (including 1998) that you have been taught by your **Chemistry** teacher
.....years
Years (including 1998) that you have been taught by your **Physics** teacher
.....years
Years (including 1998) that you have been taught by your **Biology** teacher
.....years

1.	A□	B□	C□	D□	**17.**	A□	B□	C□	D□	**33.**	A□	B□	C□	D□
2.	A□	B□	C□	D□	**18.**	A□	B□	C□	D□	**34.**	A□	B□	C□	D□
3	A□	B□	C□	D□	**19.**	A□	B□	C□	D□	**35.**	A□	B□	C□	D□
4.	A□	B□	C□	D□	**20.**	A□	B□	C□	D□	**36.**	A□	B□	C□	D□
5.	A□	B□	C□	D□	**21.**	A□	B□	C□	D□	**37.**	A□	B□	C□	D□
6.	A□	B□	C□	D□	**22.**	A□	B□	C□	D□	**38.**	A□	B□	C□	D□
7.	A□	B□	C□	D□	**23.**	A□	B□	C□	D□	**39.**	A□	B□	C□	D□
8.	A□	B□	C□	D□	**24.**	A□	B□	C□	D□	**40.**	A□	B□	C□	D□
9.	A□	B□	C□	D□	**25.**	A□	B□	C□	D□	**41.**	A□	B□	C□	D□
10.	A□	B□	C□	D□	**26.**	A□	B□	C□	D□	**42.**	A□	B□	C□	D□
11.	A□	B□	C□	D□	**27.**	A□	B□	C□	D□	**43.**	A□	B□	C□	D□
12.	A□	B□	C□	D□	**28.**	A□	B□	C□	D□	**44.**	A□	B□	C□	D□
13.	A□	B□	C□	D□	**29.**	A□	B□	C□	D□	**45.**	A□	B□	C□	D□
14.	A□	B□	C□	D□	**30.**	A□	B□	C□	D□	**46.**	A□	B□	C□	D□
15.	A□	B□	C□	D□	**31.**	A□	B□	C□	D□	**47.**	A□	B□	C□	D□
16.	A□	B□	C□	D□	**32.**	A□	B□	C□	D□	**48.**	A□	B□	C□	D□

1. Through chemical tests one finds that an apple and an orange have the following substances in the percentages indicated:

I. Water	70.0%
II. Carbohydrates	17.9%
III. Sodium chloride	2.0%
IV. Vitamin C	0.5%
V. Vitamin	0.3%
VI. Protein	0.2%

Which of these substances provide energy for man?
A) Water
B) Vitamin C
C) *sodium chloride*
D) *carbohydrates*

2. Of the following illnesses caused by the ingestion of an unbalanced diet:
I. obesity
II. malnutrition
III. rickets
IV. ceguera
Which is produced by an excess of carbohydrates and fats?

A) I only
B) IV only
C) II and III only
D) I, II and III only

3. If one reduces the secretion of hydrochloric acid and gastric enzymes considerably, one would cause an alteration in the digestion of:

A) fats
B) proteins
C) *carbohydrates*
D) *neutral fats*

4. If one burns equal amounts of the given substances which would release the greatest amounts of energy?
A) Glucose
B) Protein
C) Fats
D) *Vitamins*

5. The protein content of certain foods that man eats is essential for:
A) releasing energy
B) consuming energy
C) repairing cuts
D) *activating the functioning of certain organs*

6. If an organism is invaded by a virus or bacteria, there is an immediate increase in the production of:

A) *haemoglobin in the blood*
B) *white blood cells*
C) *nasal mucus*
D) *platelets*

7. The vaccines that are administered so that one does not contract an infectious disease are made up of:

A) *antibodies*
B) *inactive microbes*
C) *defensive substances*
D) *active white blood cells*

8. The area of the planet where it is possible to find life, is called the:

A) *Atmosphere*
B) *Lithosphere*
C) *Biosphere*
D) *Hydrosphere*

9. In an ecosystem one finds, amongst other things:

I. primary consumers
II. producers
III. light
IV. secondary consumers
V. soil
VI. water

Of these the following are considered biotic components:

A) *I, II and IV only*
B) *I, II, III and V only*
C) *III, IV, V and VI only*
D) *I, II, IV and VI only*

10. In which of the choices below are the levels of organisation of matter placed in the correct sequence?

A) *Atoms, macromolecules, cells, populations, ecosystems*
B) *Macromolecules, cells, populations, ecosystems, communities*
C) *Molecules, cells, biosphere, biome, population*
D) *Atoms, molecules, macromolecules, ecosystem, population*

11. The following are present in the process of asexual reproduction:

A) *two gametes*
B) *only one gamete*
C) *only one gonad*
D) *only one individual of the species*

12. In living organisms there may be two types of reproduction: sexual and asexual. Sexual reproduction allows for:

A) *the maintenance of the characteristic of the parents*
B) *The production of young by a single individual alone*
C) *the maintenance of the characteristics of the species*
D) *the production of variety within the species*

13. After fertilisation, new cells are generated by the process of:

A) *mitosis*
B) *meiosis*
C) *chromosomal reduction*
D) *cellular division with chromosomal reduction*

14. The definition of a species is one that states that individuals:

A) are members of a population that have similar characteristics
B) are capable of mating although they do not produce fertile young
C) live in far-removed areas although they have similar characteristics
D) able to reproduce and produce fertile young.

15. Of the following statements:

I. In photosynthesis oxygen and glucose are produced.
II. In respiration water and carbon dioxide are liberated
III. the process of photosynthesis requires water and carbon dioxide

The following statements are correct:

A) *I and II only*
B) *I and III only*
C) *II and III only*
D) *I, II and III*

For the following three questions, read carefully the following information and only after having done so, answer what is being asked of you:

Man has created a series of instruments to measure magnitude. Amongst such instruments one can mention the:

I. dynamometer
II. manometer
III. balance
IV. barometer

16. Of the instruments mentioned above, the following measures differences in pressure:

A) *I*
B) *II*
C) *III*
D) *IV*

17. Of the above mentioned instruments the following measures the weight of a body:

A) *I*
B) *II*
C) *III*
D) *IV*

18. Of the above mentioned instruments the following measures force:

A) *I*
B) *II*
C) *III*
E) *IV*

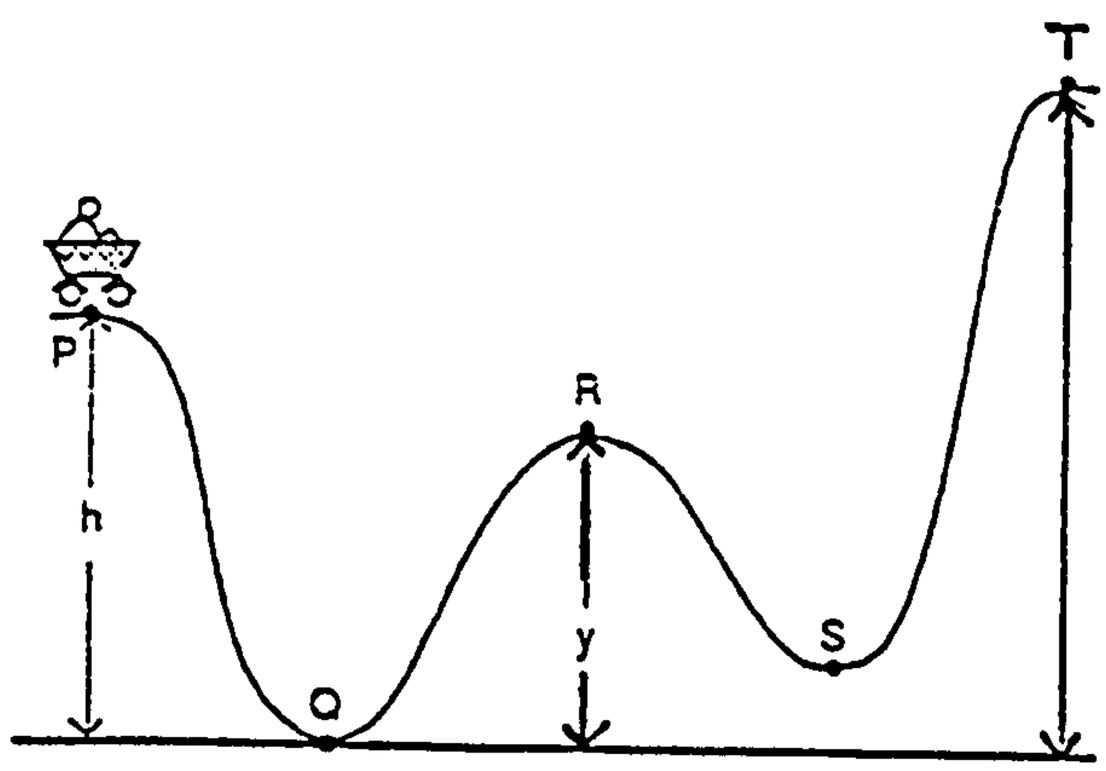
19. Which of the following statements are associated with the **law of conservation of energy?**

Energy is:
A) neither created nor destroyed
B) not destroyed, only transformed
C) sometimes destroyed, sometimes created
D) neither created nor created, only transformed

20. The motor of a toy run by batteries moves across the floor of a room. The energies involved are:

A) *Kinetic and potential*
B) *Chemical and potential*
C) *Chemical and kinetic*
D) *Kinetic and caloric (heat)*

21. Look at the following diagram



In P there is a car of mass M that is moving at a speed of v. Someone makes the following statements:

I. from P to Q there is a loss of kinetic energy
II. from Q to R there is a loss of potential energy
III. from R to S there is a gain in kinetic energy

Of these previous statements the following is (are) true:

A) *Only I*
B) *Only III*
C) *Only I and II*
D) *Only II and III*

22. In a hydroelectric centre there is a(n):

A) *transformation from mechanical to electric energy.*
B) *transformation from mechanical force to electrical force.*
C) *force is given to electrons in the electric current.*
D) *electric current is generated from the current of water.*

23. If one throws a solid object into a container of water and it sinks, this means that the object has a:

A) *mass greater than that of the water.*
B) *volume that is small*
C) *density greater than that of water.*
D) *weight greater than that of water.*

24. If a body is dilated it should:

A) *weigh practically the same as when it wasn't dilated*
B) *weigh more because it has a greater volume*
C) *weigh less because it has fewer particles of material in the same space*
D) *weigh less because the same quantity of particles of material are being shared amongst a greater volume*

25. The vapour pressure of a liquid at a given temperature is independent of the quantity of liquid and the surface area because:

A) *the external pressure is constant*
B) *it is dependent on the nature of the liquid*
C) *the force of the bonds are permanent*
D) *the total mass doesn't change*

26. When heat is transmitted by conduction it does so through:

A) *means that does not involve the displacement of material*
B) *means that does involve the displacement of material*
C) *air currents*
E) *liquid means*

27. Suppose one weighs a glass that contains 100ml of water and separately a stone that weighs 20g. The total weight measured separately is, therefore, 120g. If one then places the stone inside the glass of water and weighs them again this time together they would weigh:

A) *less than 120g*
B) *more than 120g*
C) *120g*
D) *100g*

28. One allows two objects of the same size to fall simultaneously from a height of a 10 floor building. One of the objects has a mass of 1 kg the other 5kg. The following will occur:

A) *both reach the ground at the same time.*
B) *the lighter one will reach the ground first*
C) *the heavier one will reach the ground first.*
D) *the time taken for each one to reach the ground depends on the radius of the sphere.*

29. In a spatial voyage between the earth and the moon there is a point between the two celestial bodies in which the space vehicles and their contents:

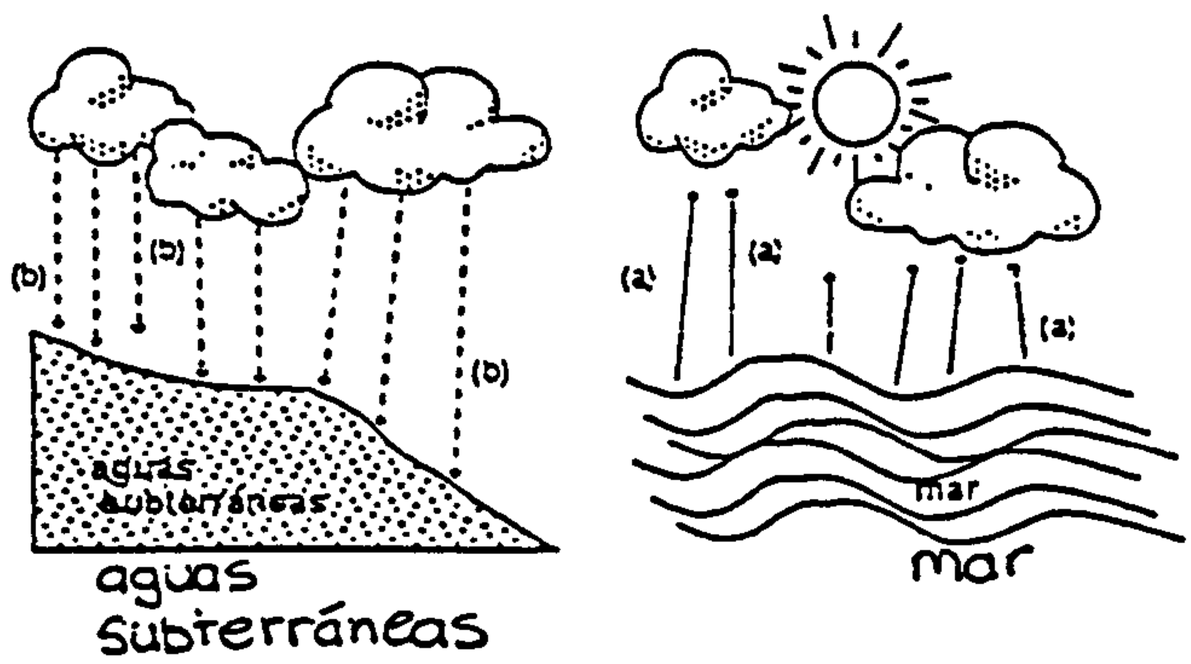
A) *do not have weight because they are not attracted either by the moon or the earth.*
B) *the weight towards the moon and towards the earth are in equilibrium*
C) *they don't have weight because they are in space*
D) *they have no mass*

30. One has two identical bodies. One of them is submerged in water. When comparing their weight using a dynamometer, the submerged body:

A) *weighs the same as the other*
B) *weighs more than the other*
C) *weighs less than the body that is not submerged*
D) *Does not change weight*

Look carefully at the following picture as the following two questions will be based upon it.

In nature there are a series of processes that take place in the form of a cycle. Observe the following diagram



31. In the diagram above, the process marked "a" represents the phenomenon of:

A) *boiling*
B) *condensation*
C) *evaporation*
D) *solidification*

32. With reference to the same diagram, the process marked "b" represents the phenomenon of:
A) *boiling*
B) *condensation*
C) *evaporation*
D) *solidification*

33 The process of combustion is characterised as:
I. a physical phenomenon
II. a chemical phenomenon.
III liberating energy.
IV absorbing heat.

Of the above the following is (are) correct:

A) *Only I*
B) *Only I and IV*
C) *Only II and III*
D) *Only II and IV*

34. The soil:

I. contains mineral salts
II. contains raw materials necessary in the formation of mineral salts
III. is capable of retaining water

Of the above, the following are important for the development of plants.

A) *Only I*
B) *Only II*
C) *Only II and III*
D) *I, II and III*

35. The following series of chemical elements are important, amongst others, for man: oxygen, carbon, sodium, nitrogen, iodine, and uranium. The symbols that correspond to the elements are respectively:

A) *O, Ca, S, N, I, U.*
B) *O, Ca. So, N, Y, U.*
C) *O, C, Na, Ni, I, U*
D *O, C, Na, N, I, U*

36. A chemical compound is made up of:

A) *one type of atom only.*
B) *atoms of different elements*
C) *atoms of the same element*
D) *heterogeneous molecules*

37. The periodic table is an ordering of elements by their:

A) *physical properties.*
B) *chemical properties.*
C) *periodic properties.*
D) *atomic number.*

38. In the particles that make up the atom are protons, neutrons, electrons and neutrinos. Of these the following participate in the formation of bonds between two atoms

A) *neutrinos*
B) *neutrons*
C) *electrons*
D) *protons*

39. Neutrons are found in the nucleus of the atom and are characterised by carrying a neutral charge and a mass that is:

A) *the same as that of the proton.*
B) *the same as that of the electron.*
C) *greater than that of the proton.*
D) *smaller than that of the proton*

40. On mixing 10g of compound A and 100g of compound B one forms a heterogeneous mixture. Following this one can conclude that:

A) *A has lost its individual characteristics.*
B) *B has lost its individual characteristics.*
C) *A and B have acquired similar characteristics.*
D) *A and B maintain their individual characteristics*

41. On combining two substances forming a mixture, the components of this mixture,:

A) *can be separated by physical means.*
B) *cannot be recovered.*
C) *can be recovered by chemical means.*
D) *change transforming into new compounds*

42. If one bubbles carbon dioxide through an aqueous solution of calcium hydroxide a chemical reaction is produced whereby calcium carbonate, practically insoluble in water, is formed. According to this information one should then observe:

A) *osmosis.*
B) *a precipitate*
C) *Brownian movement*
D) *a suspension*

43. If A, B, C and D were stereochemical coefficients of compounds in the following unbalanced equation:

$K_2Cr_2O_7 + H_2O + 3S \rightarrow 3SO_2 + KOH + Cr_2O_3$
(A) (B) (C) (D)

the combination of the following appropriate stereochemical coefficients, missing from the equation, would be needed to balance this equation:

A) *A=1; B=2; C=4; D=2*
B) *A=2; B=2; C=4; D=2.*
C) *A=4; B=2; C=8; D=2.*
D) *A=2; B=2; C=4; D=1-*

44. Calcium and oxygen form a compound of the formula is CaO. Nitrogen forms a compound with oxygen of the formula is N_2O_3. One can deduce from this information the formula of a compound made from calcium and nitrogen as being:

A) *CaN*
B) CaN_2
C) CaN_3
D) Ca_3N_2

45. In contaminated air there are toxic gases and particles in suspension harmful to the health of living organisms especially man. The contaminating gases in such air:

A) *precipitate*
B) *spread by the process of diffusion.*
C) *spread by the process of osmosis*
D) *remain stable*

APPENDIX 8 ACHIEVEMENT TEST-SPANISH VERSION

PRUEBA DE CIENCIAS

UNIVERSIDAD DE BRISTOL
BRISTOL
REINO UNIDO

UNIVERSIDAD DE LA SERENA
LA SERENA
CHILE

LEE CUIDADOSAMENTE LAS INSTRUCCIONES QUE APARECEN A CONTINUACIÓN, ANTES DE ABRIR EL CUADERNILLO DE PRUEBA

Junto a esto cuadernillo has recibido una HOJA de RESPUESTA. El cuadernillo contiene las preguntas que deberás leer cuidadosamente antes de responder. No lo utiliza para realizar las operaciones que consideres necesarias. La repuesta a cada pregunta debes registrarla sólo en la HOJA de RESPUESTAS.

Antes, de contestar la prueba, completa los datos que se te solicitan en la HOJA de RESPUESTAS: nombre, fecha de nacimiento, establecimiento y los años que has tenido tu profesor(a) de biología, Biología y física, respectivamente, como profesor (a).

El cuadernillo contiene 45 preguntas. Cada pregunta tiene CUATRO posibles RESPUESTAS u OPCIONES, identificadas con las letras A, B, C, D; pero **sólo una de ellas** es correcta.

En la sección de Respuestas de la HOJA de RESPUESTAS, encontrarás una serie progresiva de números colocados en tres columnas. Cada número corresponde al número de la pregunta respectiva en el cuadernillo. A la derecha de cada número encontrarás cuatro cuadras con las letras A, B, C, D, que corresponden a las opciones de las preguntas del cuadernillo.

Para contestar, **deberás leer** con atención cada pregunta y **elegir** la repuesta **correcta.** Luego identificas en la HOJA de REPUESTAS el número de la pregunta que vas a responder y rellenas el cuadra correspondiente a la respuesta que has elegido.

Ejemplo

80. En la fotosíntesis se produce:

A) anhídrido carbónico
B) oxígeno
C) nitrógeno
D) agua

Si analizas la pregunta puedes darte cuenta que la respuesta correcta es **B**; por lo tanto, deberás ubicar en la HOJA de RESPUESTAS **el número que corresponde** a la pregunta que respondiste y, con tu lápiz grafito, rellenar completamente el cuadra correspondiente a la letra que hayas elegido como correcta

79.	**A** ☐	**B** ☐	**C** ☐	**D** ☐
80.	**A** ☐	**B** ■	**C** ☐	**D** ☐
81.	**A** ☐	**B** ☐	**C** ☐	**D** ☐

Al contesta cada pregunta deberás llenar **solamente uno de los cuadros.** Asimismo, trata de no borrar tu respuesta; pero si es necesario, bórrala completamente con un goma adecuada. Si no tienes puedes solicitar una de tu examinador.

Trabaja rápidamente y con precisión. Si encuentras una pregunta difícil, continúa con las siguientes y si al final te sobra tiempo regresa a las que no respondiste y trata de hacerlo. No trates de adivinar, contesta lo que sepas.

HOJA DE REPUESTAS

Años (incluyendo 1998) que tienes profesor(a) de **biología** como profesor(a)
.....años
Años (incluyendo 1998) que tienes profesor(a) de **física** como profesor(a)
..... años
Años (incluyendo 1998) que tienes profesor(a) de **biología** como profesor(a)
..... años

1.	A□	B□	C□	D□	**17.**	A□	B□	C□	D□	**33.**	A□	B□	C□	D□
2.	A□	B□	C□	D□	**18.**	A□	B□	C□	D□	**34.**	A□	B□	C□	D□
3	A□	B□	C□	D□	**19.**	A□	B□	C□	D□	**35.**	A□	B□	C□	D□
4.	A□	B□	C□	D□	**20.**	A□	B□	C□	D□	**36.**	A□	B□	C□	D□
5.	A□	B□	C□	D□	**21.**	A□	B□	C□	D□	**37.**	A□	B□	C□	D□
6.	A□	B□	C□	D□	**22.**	A□	B□	C□	D□	**38.**	A□	B□	C□	D□
7.	A□	B□	C□	D□	**23.**	A□	B□	C□	D□	**39.**	A□	B□	C□	D□
8.	A□	B□	C□	D□	**24.**	A□	B□	C□	D□	**40.**	A□	B□	C□	D□
9.	A□	B□	C□	D□	**25.**	A□	B□	C□	D□	**41.**	A□	B□	C□	D□
10.	A□	B□	C□	D□	**26.**	A□	B□	C□	D□	**42.**	A□	B□	C□	D□
11.	A□	B□	C□	D□	**27.**	A□	B□	C□	D□	**43.**	A□	B□	C□	D□
12.	A□	B□	C□	D□	**28.**	A□	B□	C□	D□	**44.**	A□	B□	C□	D□
13.	A□	B□	C□	D□	**29.**	A□	B□	C□	D□	**45.**	A□	B□	C□	D□
14.	A□	B□	C□	D□	**30.**	A□	B□	C□	D□	**46.**	A□	B□	C□	D□
15.	A□	B□	C□	D□	**31.**	A□	B□	C□	D□	**47.**	A□	B□	C□	D□
16.	A□	B□	C□	D□	**32.**	A□	B□	C□	D□	**48.**	A□	B□	C□	D□

1. Por medio de ensayos químicos se encontró que la manzana y la naranja presentan las siguientes sustancias, en los porcentajes que se indican:

agua	70.0%
hidrato de carbono	17.9%
cloruro de sodio	2.0%
vitamina C	0.5%
vitamina D	0.3%
proteína	0.2%

¿Cuál de estas sustancias provee de energía al hombre?

A) *agua*
B) *vitamina C*
C) *cloruro de sodio*
D) *hidrato de carbono*

2. De las siguientes enfermedades producidas por la ingestión de dietas desequilibradas:

I. obesidad
II. desnutrición
III. raquitismo
IV. ceguera

¿Cuál(es) produce el exceso de hidratos de carbono y lípidos?

A) *Sólo I*
B) *Sólo IV*
C) *Sólo II y III*
D) *Sólo I, II y III*

3. Si se disminuye considerablemente la secreción de ácido clorhídrico y enzimas gástricas, entonces se produce una alteración en la digestión de:

A) *lípidos*
B) *proteínas*
C) *hidratos de carbono*
D) *grasas neutras*

4. ¿Si se combustionan iguales cantidades de las sustancias que indican? cuál proporciona mayor cantidad de energía?

A) *Glucidos*
B) *Proteínas*
C) *Grasas*
D) *Vitaminas*

5. Las proteínas contenidas en algunos alimentos que ingiere el hombre, sirven fundamentalmente para:

A) *liberar energía*
B) *consumir energía*
C) *reconstruir tejidos*
D) *activar el funcionamiento de algunos órganos*

6. Si al organismo ingresan virus o bacterias, inmediatamente se aumenta la producción de:

A) *hemoglobina en la sangre*
B) *glóbulos blancos*
C) *mucus nasal*
D) *plaquetas*

7. Las vacunas que se aplican para no sufrir algunas enfermedades infecciosas, están construidas por:

A) *anticuerpos*
B) *microbios inactivos*
C) *sustancias de defensa*
D) *glóbulos blancos activos*

8. La zona del planeta donde es posible encontrar vida, se denomina:

A) *Atmósfera*
B) *Litósfera*
C) *Biósfera*
D) *Hidrósfera*

9. En un ecosistema se encuentran entre otros:

I. consumidor primario
II. productor
III. luz
IV. consumidor secundario
V. suelo
VI. agua

Son componente bióticos:
A) *Sólo I, II y IV*
B) *Sólo I, II, III y V*
C) *Sólo III, IV, V y VI*
D) *Sólo I, II, IV y VI*

10. ¿En qué opción los niveles de organización de la materia están secuenciados correctamente?

A) *Átomo, macromolécula, célula, población, ecosistema*
B) *Macromolécula, célula, población, ecosistema, comunidad*
C) *Molécula, célula, biósfera, bioma, población*
D) *Átomo, molécula, macromolécula, ecosistema, población*

11. En un proceso de reproducción asexuada participa(n):

A) *dos gametos*
B) *un solo gameto*
C) *una sola gónada*
D) *un solo individuo de la especie*

12. En los seres vivos se dan dos tipos de reproducción: sexuada y asexuada. La reproducción sexuada cruzada, permite:
A) *mantener las características de los padres*
B) *obtener descendencia a través de un solo individuo*
C) *mantener las características de la especie.*
D) *que se produzca variedad dentro de la especie*

13. Producida la fecundación , se generan nuevas células por medio de:
A) *mitosis*
B) *meiosis*
C) *reducción cromosómica*
D) *división celular con reducción cromosómica*

14. La definición de especie dice relación con individuos:

A) *de una población con características semejantes*
B) *capaces de cruzarse aunque no generen progenie fértil*
C) *que habitan en zonas alejadas, aunque tienen características similares*
D) *capaces de reproducirse y formar descendencia fértil*

15. De las siguientes afirmaciones:

I. En la fotosíntesis se produce oxígeno y glucosa.
II. En la respiración se libera agua y anhídrido carbónico
III. La fotosíntesis requiere de agua y anhídrido carbónico

Es correcto afirmar que son verdaderas:

A) *Sólo I y II*
B) *Sólo I y III*
C) *Sólo II y III*
D) *I, II y III*

Para las tres preguntas siguientes lea cuidadosamente la siguiente información y, sólo después de haberlo hecho, conteste lo que se le solicita.

El hombre ha creado una serie de instrumentos para medir magnitudes. Entre dichos instrumentos podemos mencionar:
I. dinamómetro
II. manómetro
III. balanza
IV. barómetro

16. De los instrumentos anteriores, sirve para medir las diferencias de presión:

A) *I*
B) *II*
C) *III*
D) *IV*

17. De los instrumentos mencionados, sirve para medir la masa de un cuerpo:
A) *I*
B) *II*
C) *III*
D) *IV*

18. De los instrumentos nombrados, sirve para medir fuerza:

A) *I*
B) *II*
C) *III*
D) *IV*

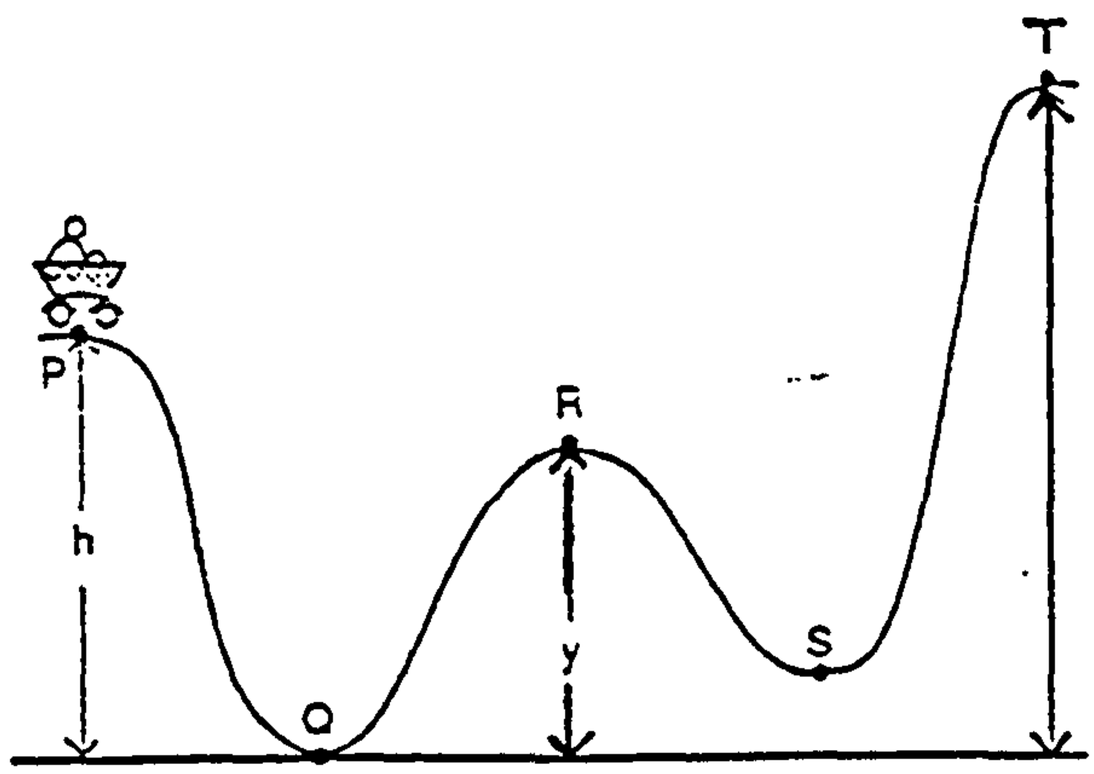
19. ¿Cuál de los siguientes enunciados corresponde a la **ley de conservación de la energía**?

La energía:
A) no es creada, ni destruida
B) no es destruida, sólo transformada
C) a veces se destruye, a veces se crea
D) no es creada ni destruida, sólo transformada

20. Con una pila se hace andar un auto de juguete sobre el piso de una habitación. Las energías involucradas son:

A) cinética y potencial
B) Biología y potencial
C) Biología y cinética
D) cinética y calórica

21. Observe el siguiente dibujo esquemático:



En P hay un carro de masa M que se mueve a una velocidad v. Alguien afirma que al ir de:

I. P a Q pierde energía cinética
II. Q a R pierde energía potencial
III. R a S gana energía cinética

De lo anterior , es (son) verdadero(s):

A) Sólo I
B) Sólo III
C) Sólo I y II
D) Sólo II y III

22. En una central hidroeléctrica se está:

A) *transformando energía mecánica en eléctrica.*
B) *transformando fuerza mecánica en fuerza eléctrica.*
C) *entregando fuerza a los electrones de la corriente eléctrica.*
D) *creando una corriente eléctrica de la corriente de agua.*

23. Si se tira un cuerpo sólido a un tiesto con agua y se hunde, quiere decir que:

A) *su masa es mayor que la del agua.*
B) *Su volumen es pequeño.*
C) *su densidad es mayor que la del agua.*
D) *su peso es mayor que el del agua.*

24. Si un cuerpo se dilata, entonces debería:

A) *pesar prácticamente lo mismo que cuando no estaba dilatado*
B) *pesar más porque tiene mayor volumen*
C) *pesar menos, porque tiene menos partículas de materia en un mismo espacio*
D) *pesar menos, porque una misma cantidad de partículas de materia estarían repartidas en un mayor volumen.*

25. La presión de vapor de un liquido a una temperatura dada es independiente de la cantidad de líquido y de su superficie porque:

A) *la presión externa es constante*
B) *depende de la naturaleza del liquido*
C) *la fuerza de los enlaces son permanentes*
D) *la masa total no cambia*

26. Cuando el calor se transmite por conducción, lo hace a través de:

A) *un medio sin desplazamiento de materia*
B) *un medio con desplazamiento de materia*
C) *corrientes de aire*
D) *un medio líquido*

27. Supongo que pesa un vaso que contiene 100ml de agua y junto a él (al lado) una piedra que pesa 20g; en esas condiciones, el conjunto pesa 120g.
Si se introduce la piedra en el agua y se vuelve a pesar, entonces el conjunta pesará:

A) *menos de 120g*
B) *mas de 120g*
C) *120g*
D) *100g*

28. Desde lo alto de un edificio de 10 pisos se dejan caer, al mismo tiempo, dos cuerpos del mismo tamaño. Uno de ellos pesa 1 kg y el otro pesa 5 kg. Sucede que:

A) *ambos llegan al mismo tiempo al suelo.*
B) *llega primero al suelo el más liviano.*
C) *llega primero al suelo el más pesado.*
D) *el tiempo que se demora cada uno en llegar depende del radio de la esfera.*

29. En un viaje espacial entre la Tierra y la Luna hay un punto entre los dos cuerpos celestes, en el cual los navíos espaciales y lo que hay dentro de ellos:

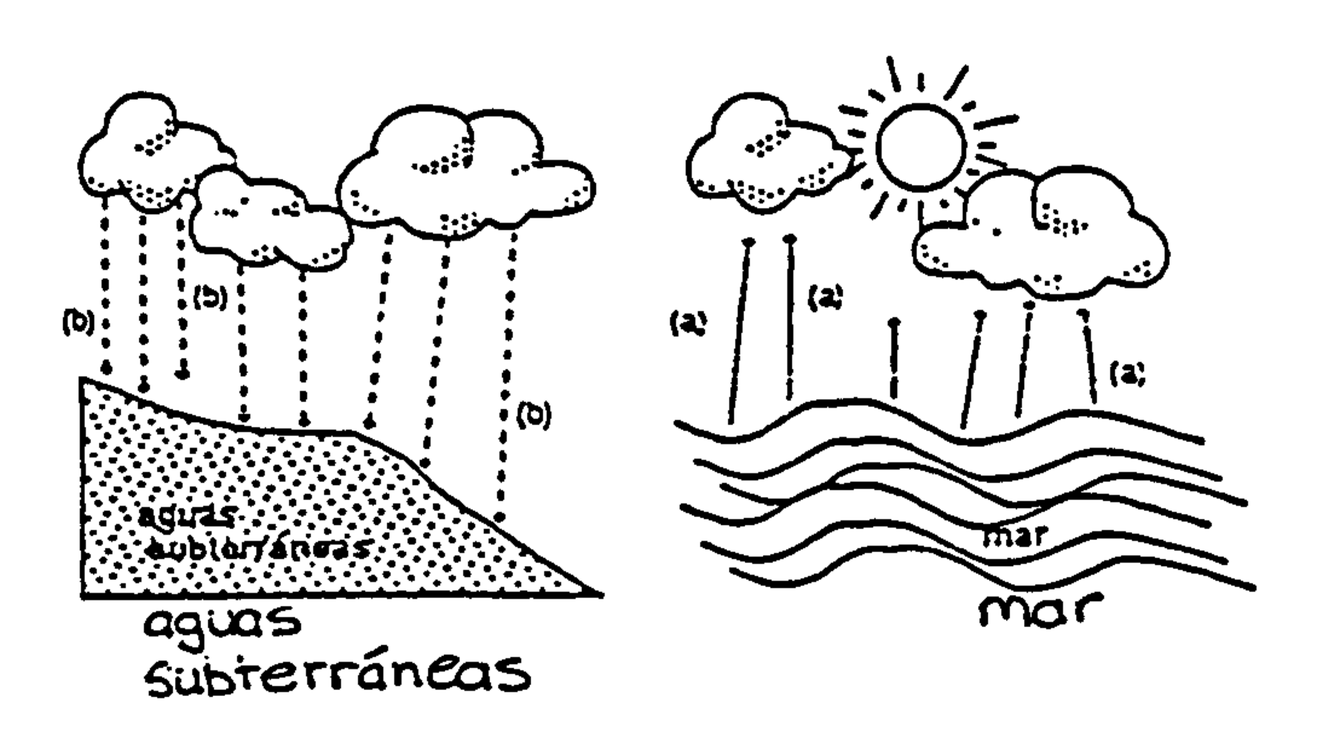
A) *no tienen peso, porque no son atraídos ni por la Tierra, ni por la Luna.*
B) *tienen un peso hacia la Tierra y hacia la Luna, equilibrado*
C) *no tienen peso por encontrarse en el espacio*
D) *no tienen masa*

30. Se tiene dos cuerpos idénticos: uno de ellos se sumerge en el agua. Al comparar sus pesos usando un dinamómetro, el cuerpo sumergido:

A) *Pesa lo mismo que el otro*
B) *Pesa más que el otro*
C) *Pesa menos que el no sumergido*
D) *No cambia de peso*

Observe atentamente el dibujo, porque las dos preguntas siguientes se basan en él.

En la naturaleza tienen lugar una serie de procesos que se dan en forma cíclica. Observe el siguiente diagrama:



31. En el esquema anterior el proceso que representa "a" corresponde al fenómeno de:
A) *ebullición*
B) *condensación*
C) *evaporación*
D) *solidificación*

32. En relación al mismo esquema anterior, el fenómeno que se dio en "**b**" corresponde a:

A) *ebullición*
B) *condensación*
C) *evaporación*
E) *solidificación*

33 Un proceso de combustión se caracteriza por:

I. ser fenómeno físico
II. ser un fenómeno químico.
III liberar energía.
IV absorber calor.

De lo anterior es (son) correcto(s)

A) *Sólo I*
B) *Sólo I y IV*
C) *Sólo II y III*
D) *Sólo II y IV*

34. El suelo:

I. proporciona sales minerales
II. proporciona materia prima necesaria para la formación de sales minerales
III. es capaz de retener agua

De lo anterior, es importante para el desarrollo de las plantas:

A) *Sólo I*
B) *Sólo II*
C) *Sólo II y III*
E) *I, II y III*

35. La siguiente serie de elementos químicos es importante, entre otros, para el hombre: oxígeno, carbono, sodio, nitrógeno, yodo, uranio. Los símbolos que corresponden a esa serie respectivamente son:

A) *O, Ca, S, N, I, U.*
B) *O, Ca. So, N, Y, U.*
C) *O, C, Na, Ni, I, U*
D) *O, C, Na, N, I, U*

36. Un compuesto químico está constituido por:

A) *un sólo tipo de átomos.*
B) *átomos de distintos elementos.*
C) *átomos de un mismo elemento.*
D) *moléculas heterogéneas*

37. El sistema periódico es una ordenación de los elementos, según:

A) *sus propiedades físicas.*
B) *sus propiedades Biologías.*
C) *sus propiedades periódicas.*
D) *su numero atómico.*

38. En las partículas que constituyen un átomo están: protones, neutrones, electrones y neutrinos. De éstos, los que intervienen directamente en el establecimiento de enlaces entre dos átomos son los:

A) *neutrinos*
B) *neutrones*
C) *electrones*
D) *protones*

39. Los neutrones que se encuentran en núcleo de los átomos, se caracterizan por presentar carga neutra y una masa:

A) *igual a la del protón.*
B) *igual a la del electrón.*
C) *mayor que la del protón.*
D) *menor que la del protón.*

40. Al mezclar 10g de un compuesto A y 100g de un compuesto B se forma un mezcla heterogénea; según esto se puede afirmar que:

A) *A pierde sus características individuales.*
B) *B pierde sus características individuales.*
C) *A y B adquieren características similares.*
D) *A y B mantienen sus características individuales.*

41. Al unirse dos sustancias formando una mezcla, los componentes de ella:

A) *pueden separarse por medios físicos.*
B) *no pueden recuperarse.*
C) *se pueden recuperar por medios químicos.*
D) *cambian transformándose en compuestos nuevos*

42. Si en una solución acuosa de hidróxido de calcio se hace burbujear anhídrido carbónico, se produce una reacción Biología que lleva a la formación de carbonato de calcio que es prácticamente insoluble en agua. Según esto, se debería observar:

A) *una osmosis.*
B) *un precipitado*
C) *movimientos brownianos*
D) *una suspensión*

43. Sean A, B, C y D los coeficientes estequiométricos de los compuestos que se indican en la ecuación siguiente, que no se representa balanceada, equilibrada:

$K_2Cr_2O_7 + H_2O + 3S \rightarrow 3SO_2 + KOH + Cr_2O_3$
(A) (B) (C) (D)

Para balancear la reacción, el conjunto de coeficientes estequiométricos apropiados, que faltan en la ecuación, aparecen en la opción:

A) *A=1; B=2; C=4; D=2*
B) *A=2; B=2; C=4; D=2.*
C) *A=4; B=2; C=8; D=2.*
D) *A=2; B=2; C=4; D=1*

44. El calcio y el oxígeno forman un compuesto cuya fórmula es CaO; el nitrógeno forma con el oxígeno un compuesto cuya fórmula es N_2O_3. Como consecuencia se puede deducir que la fórmula que corresponde a un compuesto de calcio y nitrógeno es:

A) CaN
B) CaN_2
C) CaN_3
D) Ca_3N_2

45. En el aire contaminado hay gases tóxicos y partículas en suspensión, nocivas para la salud de los seres vivos y en especial para el hombre. Los gases contaminantes en dicho aire:

A) *precipitan*
B) *se esparcen por proceso de difusión.*
C) *se esparcen por proceso de osmosis*
D) *permanecen estables*

APPENDIX 9 PARENTS' QUESTIONNAIRE-ENGLISH VERSION

Dear Parents

The University of Bristol, United Kingdom in collaboration with the University of La Serena, Chile is conducting research into the educational system in Chile. It is necessary, therefore, for our work, to collect information about the families of the students at your.

ALL INFORMATION THAT YOU SUBMIT TO US WILL BE TREATED AS STRICTLY CONFIDENTIAL.

Yours faithfully

Sarah Hean

Universidad de Bristol
35 Berkeley Square
Bristol
UK

WHEN YOU HAVE COMPLETED THIS QUESTIONNAIRE, PLEASE PLACE IT IN THE ENVELOPE YOU HAVE RECEIVED AND RETURN TO THE SCHOOL WITH YOUR SON OR DAUGHTER

INFORMATION ABOUT YOUR FAMILY

1. The name of your son or daughter at present in the second year of secondary education ***(Please specify in the space below)***

---

2. How many people live in your home? ***(Please specify in the space below, e.g., 3 - mother and two children)***

---

3. What is the educational level of the father? ***(Please mark the appropriate square)***

University ☐

University (incomplete) ☐

Technical ☐

Secondary (complete) ☐

Secondary (incomplete) ☐

Primary ☐

4. What is the salary (net) of the father? ***(Please specify in the space below)***

---

5. What is the educational level of the mother? ***(Please mark the appropriate square)***

University ☐

University (incomplete) ☐

Technical ☐

Secondary (complete) ☐

Secondary (incomplete) ☐

Primary ☐

6. What is the salary (net) of the mother? ***(Please specify in the space below)***

(Indicate of your occupation is that of a housewife)?

THANK YOU VERY MUCH FOR ASSISTANCE

APPENDIX 10 PARENTS' QUESTIONNAIRE- SPANISH VERSION

Estimados Padres

La Universidad de Bristol, Reino Unido, en colaboración con La Universidad de La Serena, Chile, está haciendo una investigación sobre la sistema educativo Chileno. Es necesario, por lo tanto, para el trabajo nuestro, a recoger datos sobre las familias de los estudiantes en el colegio.

TODO LA INFORMACIÓN QUE USTEDES SUMINISTREN SERÁ TRATADA DE UNA MANERA ESTRICTAMENTE CONFIDENCIAL.

Muy atentamente

Sarah Hean

Universidad de Bristol
35 Berkeley Square
Bristol
UK

CUANDO HAYA COMPLETADO ESTE CUESTIONARIO, POR FAVOR INTRODÚZCALO EN EL SOBRE (EN QUE LO RECIBIÓ) Y DEVUÉLVALO (CON SU HIJO/A) AL COLEGIO.

INFORMACIÓN SOBRE SU FAMILIA

1. Nombre de su hijo/a que está en el segundo año de Educación Media ***(Por favor especifique en el espacio debajo)***

_____

2. ¿Cuántas personas viven en su casa? ***(Por favor especifique en el espacio debajo, ej. 3 : madre y dos hijos)***

_____

3. Cuál es la educación del padre? ***(Por favor marque el cuadro apropiado)***

Universitario ☐

Universitario Incompleto ☐

Técnico ☐

Media completa ☐

Media Incompleta ☐

Básica ☐

4. ¿Cuánta es la renta (liquida) del padre?

_____

5. ¿Cuál es la educación de la madre? ***(Por favor especifique en el espacio debajo)***

Universitario ☐

Universitario Incompleto ☐

Técnico ☐

Media completa ☐

Media Incompleta ☐

Básica ☐

6. ¿Cuánta es la renta (liquida) de la madre ***(Indique si usted es dueña de casa)*****?**

_____

¡Muchismas gracias por su tiempo y ayuda!

APPENDIX 11 DESCRIPTIVE STATISTICS FOR BACKGROUND, STUDENT AND TEACHER VARIABLES AND COMPARISON OF SAMPLE STATISTICS WITH NATIONAL AND REGIONAL FIGURES (CHAPTER 5 & 6)

A11.1. Descriptive statistics for student background characteristics

Information on student background variables was collected and the description and distribution of these variables can be viewed in Table A11.01 and A11.02. Where possible sample characteristics were compared with regional or national statistics (Ministerio de Educación Publíca, 1996).

Table A11.01: Descriptive data for continuous student background characteristics

Variable	Mean	Standard deviation	N
Age *(years)*	15.4	0.7	593
Income per student family member *(pesos/individual family member)*	69 768	58 463	326
Ability	49	6	530

The approximation of the distributions of continuous type data (student ability, age and income per student family member) to a normal curve was assessed using a visual review of histograms representing this data. Furthermore, distributions were judged on their adequacy in variation (of which the standard deviation is a measure), skewness and kurtosis. Variation was considered adequate for all distributions and intelligence and school fee distributions were judged as being adequate in their approximation of the normal curve. The age and income per family member variables were of greater concern both showing a tendency towards a positively skewed and leptokurtic distribution. This was not considered sufficiently severe to warrant a transformation of the data but should be remembered when the adequacy of the variable is being considered in subsequent analyses.

Table A11.02: Descriptive data for non-continuous type student background characteristics

Variable	Student number (%)
Student gender	
Female	306 (49%)
Male	299 (48%)
Missing data	20 (3%)
Number of students studying in different location of schools	
La Serena	439 (70%)
Average class size	39
Coquimbo	186 (30%)
Average class size	31
Number of students in different school administrations	625
Municipal	223 (36%)
Average class size	37
Subsidised	402 (64%)
Average class size	37
Humanistico Cientifica secondary students in subsidised institutions in Chile*	337874
Municipal	67%
Subsidised	33%
School fees paid per month (pesos)	
Group 1 (12 501-31 000)	191 (31)
Group 2(5 001-12 500)	177 (28%)
Group 3(0-5 000)	257 (41%)
Father's education	
Group1 (tertiary education)	181 (29%)
Group 2 (completed secondary education)	110 (18%)
Group 3 (incomplete secondary or primary level education)	107 (17%)
Missing	227 (36%)
Mother's education	
Group1 (tertiary education)	141 (23%)
Group 2 (completed secondary education)	136 (22%)
Group 3 (incomplete secondary or primary level education)	138 (22%)
Missing	210 (34%)

*Ministerio de Educación Publíca, 1996

If the student sample is reviewed for possible bias, it would seem that by gender there is roughly an equal number of male and female students. By location, however, it appears that students from La Serena account for more than two thirds of the sample. Subsidised schools are also in the majority, just under two thirds of students attending this type of administration. An over representation of students from subsidised schools

was found in the sample if compared to the national figures but this was in line with the distribution of schools in the La Serena and Coquimbo locations (Table A11.07).

Average classes sizes are high, and in disagreement with Pascual Kelly (1995), in La Serena and Coquimbo at least, and in both private subsidised and municipal schools, a crisis in class numbers is not exaggerated. Differences in class size between locations and between school administrations were not significant, however. (t=-1.2; d.f.=5.8 and t=-0.1; d.f.=5.8 respectively). More even distributions of data were observed for the school fee and parental education data.

The representativeness of the student sample based on a comparison by gender (Table A11.03 and A11.04) appeared to be sufficiently similar to statistics presented for the national and regional averages, although there may be a slight under representation of female students in the private subsidised sector of the sample.

Table A11.03: Distribution of students by gender in the Humanistico Cientifica (H.C.) subsidised sector

School	Female students (%)
H.C. secondary schools in IV region*	55
H.C. secondary schools in Chile*	54
H.C. secondary schools in sample	49

*students from both rural and urban zones are represented in the national and regional statistics; (Ministerio de Educación Publíca, 1996)

Table A11.04: Distribution of students by type of school administration and by gender in the subsidised sector

School administration	Female students (%)
Second year secondary schools in Chile*	51
Municipal	51
Subsidised	52
Second year secondary schools in IV region-*	51
Municipal	47
Subsidised	61
Second year secondary schools in sample	49
Municipal	46
Subsidised	51

**students from both rural and urban zones are represented in the national and regional statistics; (Ministerio de educación publíca, 1996)

A11.2. Descriptive statistics for school background characteristics

Data is presented whereby schools are distributed by their administration (Table A11.05 and A11.06) or location (Table A11.07).

Table A11.05: Distribution of Humanistico Cientifica (H.C). type urban secondary schools in the region by the type of administration of school

School Administration	Number and percentage of schools
H.C. type secondary subsidised schools in Chile (excluding adult education)	944
Municipal	49%
Subsidised	51%
H.C. type secondary subsidised schools in sample	17
Municipal	35%
Subsidised	65%

*the schools presented in the national statistics include those in the rural areas (Ministerio de educación publíca, 1996)

Table A11.06: Distribution of urban Humanistico Cientifica (H.C.) type secondary classes in the region by the type of administration of school

School Administration	Number and percentage of schools
Secondary subsidised urban classes in Chile	9067
Municipal	68%
Subsidised	32%
Secondary subsidised urban classes in the IV region	448
Municipal	69%
Subsidised	31%
H.C. type secondary urban subsidised classes in the sample	17
Municipal	35%
Subsidised	65%

*the classes presented in the national statistics include those in the rural areas (Ministerio de educación publíca, 1996)

Table A11.07: Distribution of urban Humanistico Cientifica (H.C.) type secondary schools by location and by administration

Location of school	Number and percentage of schools
La Serena	**11 (65%)**
Municipal	4 (36%)
Subsidised	7 (64%)
Coquimbo	**6 (35%)**
Municipal	2 (33%)
Subsidised	4 (67%)

If compared to Chile as a country and the IV region alone, again there appears to be an over representation of private subsidised schools or classes. Although this was the nature of the school population in the two locations chosen for study (Table A11.07), it does mean that extrapolations of results to Chile as a region is not possible. It is worth noting that municipal schools tend to be larger than the private subsidised establishments and with several classes making up a single year. Selecting one course alone from municipal schools has helped cause the imbalance between municipal and

A11.3. Descriptive statistics for teacher background characteristics

Information on teacher background variables was collected and the description and distribution of these variables viewed in Table A11.08 and 11.09. Again, a comparison where possible is made with national figures.

The approximation of the distributions of continuous type data (age of teacher, income per teacher family member, years of service at the present institution, teaching experience, total number of working hours, hours worked in the school where the questionnaire was applied) to a normal curve was assessed using a visual review of histograms representing the frequency distributions. Judgement on distributions were based upon their adequacy in variation (of which the standard deviation is a measure), skewness and kurtosis.

Variation was considered adequate for all distributions and in general the continuous type distributions were considered sufficiently normal to be accepted for parametric analysis. Concerns may be expressed for the distributions of the age of Physics teachers that showed a tendency towards positive skewness and the hours worked in the school where the questionnaire was applied that showed negative skewness. This was not considered sufficiently severe to warrant a transformation of the data but should be remembered when the adequacy of the variables are being considered in subsequent analyses.

Table A11.08: Descriptive data for continuous-type teacher background variables

Teacher variable	Mean	Standard deviation	N
Age *(years)*			
Total sample	41.2	8.9	42
Physics teachers	42.4	10.7	14
Biology teachers	39.4	8.7	17
Chemistry teachers	41.2	7.8	15
Income per teacher family member (*pesos/individual family member*)			
Total sample	141228	83 499	36
Physics teachers	100 518	126 900	10
Biology teachers	127 927	6 502	16
Chemistry teachers	150 836	82 887	15
Service at the institution where questionnaire applied (*years*)			
Total sample	9.0	8.6	40
Physics teachers	8.3	11.5	14
Biology teachers	10.2	6.5	14
Chemistry teachers	8.4	7.3	16
Experience *(years)*			
Total sample	14.0	9.3	45
Physics teachers	14.0	10.8	15
Biology teachers	12.1	7.9	17
Chemistry teachers	14.1	9.1	17
Total hours work in all establishments in which employed (*hours*)			
Total sample	37	11	40
Physics teachers	40	12	13
Biology teachers	36	10	15
Chemistry teachers	36	10	16
Hours in establishment in which questionnaire applied (*hours*)			
Total sample	30	11	39
Physics teachers	32	12	12
Biology teachers	30	11	15
Chemistry teachers	25	11	16

Table A11.09: Descriptive data for non continuous type teacher background characteristics

Location of school	**Number and percentage of teachers**
La Serena	31 (69%)
Coquimbo	13 (29%)
Both	1 (2%)
Number of establishments in which teachers work	
1	25(56%)
2	15 (33%)
3	2 (4%)
Missing	3 (7%)
Subjects teachers teach	
Chemistry	14 (31%)
Physics	14 (31%)
Biology	15 (33%)
Chemistry, Physics and Biology	1 (2%)
Chemistry and Biology	1 (2%)
Teacher gender	
Female	29 (64%)
Male	16 (36%)
Teacher gender in Chile*	
Female	79045 (70%)
Male	33879 (30%)
Teacher gender in IV region*	
Female	3512 (68%)
Male	1665 (32 %)

*Ministerio de educación publíca (1996)

Over a third of the teacher sample work in the La Serena region and just over half work in one institution only (Table A11.09). Thirty seven percent of teachers are working in more than one institution, however, which in contradiction to sentiment held by Pascual Kelly (1995), is felt to be a substantial percentage of the teachers sampled. In agreement with this author, however, the average number of working hours did not appear excessive (Table A11.08), although whether these hours include allowance for preparation and marking time is not clear.

The greater proportion of female teachers both regionally and nationally is reflected in the teacher sample but it should be remembered that the sample reflects science teachers alone whereas national and regional statistics represent the full range of subject

teachers. Comparisons with national figures specifically for science teachers alone by subject are made in Tables A11.10, A11.11 and A11.12.

Table A11.10: Distribution of Physics teachers by gender

Gender	Physics	National figures*
Male	10 (67%)	899 (65.1%)
Female	5 (33%)	481 (35%)

*(Ugarte Iglesias *et al.*, 1997)

Table A11.11: Distribution of Biology teachers by gendert

Gender	Biology	National figures*
Male	4 (24%)	1060 (38%)
Female	13 (76%)	1733 (62%)

*(Ugarte Iglesias *et al.*, 1997)

Table A11.12: Distribution of Chemistry teachers by gender

Gender	Chemistry	National figures*
Male	2 (13%)	568 (39%)
Female	14 (88%)	897 (61%)

*(Ugarte Iglesias *et al.*, 1997)

From a general review of the descriptive statistics above, it would appear that the majority of Biology and Chemistry teachers in both the sample and nationally are female, the reverse trend being observed in the subject of Physics. Although the percentage of male and female Physics and Biology teachers in the sample were comparable to those nationally, the Chemistry sample particularly showed an over sampling of female Chemistry teachers making once again conclusions about the wider Chilean context difficult.

The distribution of teachers based upon the administration of their school was also deemed of interest and these distributions alongside comparisons with appropriate national and regional figures are presented in Tables A11.13 and A11.14.

Table A11.13: Distribution of teachers by type of school administration in the subsidised sector

School Administration	Number and percentage of teachers
Teachers in subsidised secondary education in Chile*	2394
Municipal	65%
Subsidised	35%
Teachers in subsidised secondary education in sample	45
Municipal	33%
Subsidised	67%

*teachers of all subjects and curriculum type are represented in the national statistics (Ministerio de Educación Publíca, 1996)

Table A11.14: Distribution of teachers by type of school administration and by gender in the subsidised sector

School administration	Number and percentage female teachers
Teachers in subsidised all educational levels in Chile*	112924 total teachers
Municipal	70%
Subsidised	70%
Teachers in subsidised secondary education in IV region	5177 total teachers
Municipal	66%
Subsidised	73%
Teachers in subsidised secondary education in sample	45 total teachers
Municipal	73%
Subsidised	60%

*teachers of all subjects, zone (rural/urban) and educational level are represented in the national and regional statistics (Ministerio de educación publíca, 1996)

The teacher sample represents a greater percentage of teachers from the private sector than given nationally although the distribution of teachers gender by school administration type were comparable with national and regional statistics.

Finally the teacher sample may be distributed according to their age as displayed in Table A11.15.

Table A11.15: Distribution of teachers by age and school administration

Age of Teachers in Chile	Total	%	Municipal	%	Private subsidised	%
0-30.0	14 945	11	3 891	5	6975	21
30.1-40.0	39 861	30	17 997	23	14101	42
40.1-50.0	47 337	36	33 682	43	8120	24
50.1-60.0	24 222	18	18 942	24	2946	9
>60.0	7 140	5	4 649	6	1625	5
Age of Teachers in sample	**Total**	**%**	**Municipal**	**%**	**Private subsidised**	**%**
0-30.0	3	7	1	7	2	7
30.1-40.0	20	44	5	33	15	50
40.1-50.0	15	33	5	33	10	33
50.1-60.0	3	7	2	13	1	3
>60.0	1	2	0	0	1	3
Missing	3	6.7	2	13.3	1	3.3

Although the above national figures (Table A11.15) are representative of teachers at all educational levels, the sample appeared not to be very different from the national averages, showing slightly higher percentages in the 30.1-40.0 year age group.

Direct comparisons are not always possible with national and regional figures, due to the dissimilarity in which the latter populations have been presented and analysed. Despite, this, A general analysis of the teacher sample leads to the conclusion that on

age and gender, as a whole the teachers selected do not seem to be very different from the larger Chilean or regional population from which they were drawn. An over representation of Chemistry female teachers and private sector schools is obvious, the latter also being true for the student sample. This makes conclusions concerning findings in this thesis somewhat limited to the regions of Coquimbo and La Serena.

A11.4. Descriptive statistics for student attitude and belief scales

The frequency distributions of the student attitude and belief scales were judged to exhibit sufficient variation and to approximate a normal curve for parametric analyses, the exception being the distribution of the attitude to the Biology teacher which demonstrated a tendency to negative skewness. Again this was not seen as sufficiently deviant so as to warrant further transformation of all of the data. The mean and standard deviation scores calculated for each scale can be viewed in Table A11.16.

Table A11.16: Descriptive statistics for student attitude and belief data

Variable	Mean	Standard deviation
Attitude to science as a career	0.2 (d.f.=540)	0.9
Attitude to Physics class	0.2 (d.f.=551)	0.9
Attitude to Chemistry class	0.3 (d.f.=547)	0.9
Attitude to Biology class	0.7 (d.f.=549)	0.8
Attitude to Physics teacher	0.2 (d.f.=548)	1.0
Attitude to Chemistry teacher	0.3 (d.f.=545)	1.0
Attitude to Biology teacher	0.6 (d.f.=548)	0.9
Perception of Physics teacher's job satisfaction	0.7 (d.f.=540)	0.7
Perception of Chemistry teacher's job satisfaction	0.7 (d.f.=544)	0.7
Perception of Biology teacher's job satisfaction	0.9 (d.f.=548)	0.6

A11.5. Descriptive statistics for student achievement scores

A review of the distributions of the independent test scores and term scores showed approximately normal distributions with adequate variation to proceed with parametric analyses. Mean scores and standard deviations as an indication of the distribution of the scores are displayed in Tables A11.17 and A11.18.

Table A11.17: Descriptive statistics for independent achievement test scores

Variable	Mean	Standard Deviation
Physics score	6	2
Biology score	6	2
Chemistry score	7	2

Table A11.18: Descriptive statistics for term marks

Variable	Mean	Standard Deviation
Physics term mark	4.8	1.1
Biology term mark	5.1	1.0
Chemistry term mark	5.1	1.0

APPENDIX 12 FULL ANALYSIS OF RELATIONSHIPS BETWEEN BACKGROUND CHARACTERISTICS AND TEACHER AND STUDENT VARIABLES (CHAPTER 6)

A12.1. Relationships between background characteristics

Table 12.A: Description of results tables of interactions between background characteristics

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Father's education	-		A12.01	A12.03		A12.07	A12.07											
2. Mother's education		-	A12.02	A12.04			A12.07											
3. School administration			-		A12.06	A12.05	A12.07				A12.31	A12.33	A12.39	A12.41	A12.37	A12.35	A12.14-A12.17	A12.43-A12.46
4. Location of school				-	A12.06	A12.05	A12.08				A12.31	A12.33	A12.39	A12.41	A12.37	A12.35	A12.18-A12.21	A12.47-A12.50
5. School fees					-		A12.07				A12.31	A12.33	A12.39	A12.41	A12.37	A12.35	A12.26-A12.29	A12.51-A12.54
6. Income per student family member						-	A12.08				A12.30	A12.32	A12.38	A12.40	A12.36	A12.35	A12.13	A12.42
7. Student ability							-		A12.08			A12.32	A12.38	A12.40	A12.36	A12.34	A12.13	A12.42
8. Student age								-			A12.30	A12.32	A12.38	A12.40	A12.36	A12.34	A12.13	A12.42
9. Student gender									-									
10. Subject										-	A12.09	A12.09	A12.09	A12.09	A12.09	A12.09	A12.10	A12.11/ A12.12
11. Teacher age											-	A12.30	A12.30	A12.30	A12.30	A12.30	A12.13	A12.31
12. Teacher experience												-	A12.32	A12.32	A12.32	A12.32	A12.13	A12.33
13. Total hours worked by teacher													-	A12.38	A12.36	A12.34	A12.13	A12.34
14. Income per teacher family member														-	A12.36	A12.34	A12.13	A12.41
15. Hours worked in particular school															-	A12.34	A12.13	A12.37
16. Years at particular school																-	A12.13	A12.35
17. Teacher gender																	-	A12.22 - A12.25
18. Number of establishments in which teacher works																		-

Table A12.01: Distribution of student sample by father's education and administration of school

	Level of education	Group 1	Group 2	Group 3	Total
School Administration	Municipal	32	35	71	*138*
	Subsidised	149	75	36	*260*
Total		*181*	*110*	*107*	*398*
Pearson's Chi squared	70.9*** (d.f.=2)				

Table A12.02: Distribution of student sample by mother's education and administration of school

	Level of education	Group 1	Group 2	Group 3	Total
School administration	Municipal	22	44	75	*141*
	Subsidised	119	92	63	*274*
		141	*136*	*138*	*415*
Pearson's Chi squared	46.9*** (d.f.=2)				

Table A12.03: Distribution of student sample by father's education and location of school

	Level of education	Group 1	Group 2	Group 3	Total
Location of school	La Serena	130	73	76	*279*
	Coquimbo	51	37	31	*119*
		181	*110*	*107*	*398*
Pearson's Chi squared	1.0 (d.f.=2)				

Table A12.04: Distribution of student sample by mother's education and location of school

	Level of education	Group 1	Group 2	Group 3	Total
Location of school	La Serena	130	73	76	*279*
	Coquimbo	51	37	31	*119*
	Coquimbo	51	37	31	*119*
		181	*110*	*107*	*398*
		181	*110*	*107*	*398*
Pearson's Chi squared	1.7 (d.f.=2)				
Pearson's Chi squared	1.7 (d.f.=2)				

Table A12.05: Relationships between income per student family member by location and by school administration

Variable	T test
Location (Coquimbo)/income per family member	0.1 (d.f.=251.5)
School administration (subsidised)/income per family member	9.6*** (d.f.=302.8)

Table A12.06: Relationship between school fees, school location and administration

Variable	T test
Location (Coquimbo)/school fees+	-6.0*** (d.f.=466.0)
School administration (subsidised)/school fees+	30.4*** (d.f.=489.1)

+Uncategorised continuous data on school fees were utilised as Chi squared analysis of categorised data led to several cells remaining empty.

Table A12.07: Relationships between student ability and the student and school characteristics of parental education and school fees paid per month

Variable	One way ANOVA (F value)
Ability/father's education	17.3*** (d.f.=363); A significant difference in group means lies between education group 1 and 3 (4.7***) and education groups 2 and 3 (3.2***)
Ability/mother's education	13.6*** (d.f.=380); A significant difference in group means lies between education group 1 and 2 (2.3*) and education group 1 and 3 (4.1***)
Ability/School fee	45.5*** (d.f.=529); A significant difference in group means lies between fee group 1 and 3 (4.4***) and fee group 2 and 3 (5.3***)

Table A12.08: Relationships between student ability and student and school characteristics of student gender, school location, school administration type and family income per member

Student variable*	t-test/correlation
Ability/ gender (female)	t=-1.7 (d.f.=522.6)
Ability/location (Coquimbo)	t=0.1 (d.f.=258.5)
Ability/administration (subsidised)	t=8.8*** (d.f.=313.6)
Ability/income per student family member	r=0.2*** (d.f.=302)

*The variable in parenthesis indicates the direction in which the relationship lies

Table A12.09: Relationships between teacher background characteristics and science subject taught

Variable	One way ANOVA (F value)
Teacher age	0.4 (d.f.=45)
Experience	0.2 (d.f.=48)
Total hours worked by teacher	0.6 (d.f.=43)
Income per teacher family member	0.4 (d.f.=39)
Hours worked in particular school	1.7 (d.f.=42)
Years at particular school	0.8 (d.f.=43)

Table A12.10: Distribution of teacher sample by gender and subject taught

	Subject	Chemistry	Physics	Biology	Total
Gender	Male	3	10	4	*17*
	Female	14	5	13	*32*
Total		*17*	*15*	*17*	*49*
Pearson's Chi squared	9.9** (d.f.=2)				

Table A12.11: Distribution of teacher sample by number of establishments in which teacher works and subject taught

	Subject	Chemistry	Physics	Biology	Total
Number of schools in which work	1	5	8	13	*26*
	2	11	6	3	*20*
Total		*16*	*14*	*16*	*46*
Pearson's Chi squared	8.1 (d.f.=2)				

Table A12.12: Distribution of teacher sample by number of establishments in which teacher works and subject taught (Chemistry and Biology alone)

	Subject	Chemistry	Biology	Total
Number of establishments in which they work	2 or more	11	4	*15*
	Only 1	5	11	*16*
		16	*15*	*31*
Pearson's Chi squared	5.5* (d.f.=2)			

Table A12.13: Relationships between teacher gender and other background characteristics (t-tests)

Independent variable	Total sample	Chemistry	Physics	Biology
Teacher gender(female)/experience	-0.8 (d.f.=23.4)	-0.2 (d.f.=2.3)	-1.3 (d.f.=11.4)	0.3 (d.f.=10.0)
Teacher gender(female)/teacher age	-0.8 (d.f.=21.9)	-0.1 (d.f.=2.5)	-1.3 (d.f.=11.2)	0.5 (d.f.=9.6)
Teacher gender(female)/ years at present school	0.3 (d.f.=20.4)	1.3 (d.f.=3.8)	-0.3 (d.f.=9.8)	0.2 (d.f.=5.9)
Teacher gender (female)/hours working at present school	-2.5* (d.f.=27.9)	1.3 (d.f.=2.9)	-2.7 (d.f.=3.9)	-3.9** (d.f.=10.8)
Teacher gender(female)/total hours worked	-0.7 (d.f.=29.4)	3.5** (d.f.=10.0)	-0.6 (d.f.=6.0)	-1.6 (d.f.=12.1)
Teacher gender (female)/income per student family member	-	-0.5 (d.f.=2.3)	-2.7* (d.f.=11.0)	-0.8 (d.f.=5.8)
Teacher gender(female)/income per teacher family member	2.7* (d.f.=34.0)	1.6 (d.f.=4.3)	1.0 (d.f.=4.7)	1.5 (d.f.=11.6)
Teacher gender(female)/student ability	-	-0.8 (d.f.=10.6)	-1.4 (d.f.=4.5)	-1.7 (d.f.=7.7)
Teacher gender(female)/student age	-	-0.5 (d.f.=2.1)	0.1 (d.f.=8.6)	0.3 (d.f.=13.0)

Table A12.14: Relationships between teacher gender in total sample and school administration

	Gender	Male	Female	Total
School Administration	Municipal	4	11	*15*
	Subsidised	12	18	*30*
Total		*16*	*29*	*45*
Pearson's Chi squared	0.8 (d.f.=1)			

Table A12.15: Relationships between Chemistry teacher gender and school administration

	Gender	Male	Female	Total
School Administration	Municipal	1	5	*6*
	Subsidised	2	9	*11*
Total		*3*	*14*	*17*
Pearson's Chi squared	0.0(d.f.=1)			

Table A12.16: Relationships between Physics teacher gender and school administration

	Gender	Male	Female	Total
School Administration	Municipal	2	3	5
	Subsidised	8	2	10
Total		10	5	15
Pearson's Chi squared	2.4 (d.f.=1)			

Table A12.17: Relationships between Biology teacher gender and school administration

	Gender	Male	Female	Total
School Administration	Municipal	3	1	4
	Subsidised	8	5	13
Total		11	6	17
Pearson's Chi squared	0.2 (d.f.=1)			

Table A12.18: Relationships between teacher gender in total sample and school location

	Gender	Male	Female	Total
Location of school	Coquimbo	4	9	13
	La Serena	12	20	32
Total		16	29	45
Pearson's Chi squared	0.2 (d.f.=1)			

Table A12.19: Relationships between Chemistry teacher gender and school location

	Gender	Male	Female	Total
Location of school	Coquimbo	1	5	6
	La Serena	2	9	11
Total		3	14	17
Pearson's Chi squared	0.0(d.f.=1)			

Table A12.20: Relationships between Physics teacher gender and school location

	Gender	Male	Female	Total
Location of school	Coquimbo	2	3	5
	La Serena	8	2	10
Total		10	5	15
Pearson's Chi squared	2.4 (d.f.=1)			
Pearson's Chi squared	2.4 (d.f.=1)			

Table A12.21: Relationships between Biology teacher gender and school location

	Gender	Male	Female	Total
Location of school	Coquimbo	2	4	6
Location of school	Coquimbo	2	4	6
	La Serena	2	9	11
	La Serena	2	9	11
Total		4	13	17
Total		4	13	17
Pearson's Chi squared	0.5 (d.f=1)			
Pearson's Chi squared	0.5 (d.f=1)			

Table A12.22: Relationships between teacher gender in total sample and the number of schools in which she works

	Gender	Male	Female	Total
Number of schools in which work	2 or more	4	12	*16*
	1	11	15	*26*
Total		*15*	*27*	*42*
Pearson's Chi squared	1.3 (d.f.=1)			

Table A12.23: Relationships between Chemistry teacher gender and the number of schools in which she works

	Gender	Male	Female	Total
Number of schools in which work	2 or more	2	9	*11*
	1	1	4	*5*
Total		*3*	*13*	*16*
Pearson's Chi squared	0.0 (d.f.=1)			

Table A12.24: Relationships between Physics teacher gender and the number of schools in which she works

	Gender	Male	Female	Total
Number of schools in which work	2 or more	3	3	*6*
	1	6	2	*8*
Total		*9*	*5*	*14*
Pearson's Chi squared	0.9 (d.f.=1)			

Table A12.25: Relationships between Biology teacher gender and the number of schools in which she works

	Gender	Male	Female	Total
Number of schools in which work	2 or more	0	4	*4*
	1	4	7	*11*
Total		*4*	*11*	*15*
Pearson's Chi squared	2.0 (d.f.=1)			

Table A12.26: Relationships between teacher gender in total sample and the school fees paid per month

	Gender	Male	Female	Total
School fees paid	1	8	7	*15*
	2	4	8	*12*
	3	4	14	*18*
Total		*16*	*29*	*45*
Pearson's Chi squared	3.5 (d.f.=2)			
t-test	1.5 (d.f.=26.8)			

Table A12.27: Relationships between Chemistry teacher gender and the school fees paid per month

	Gender	Male	Female	Total
School fees paid	1	1	4	*5*
	2	0	4	*4*
	3	2	6	*8*
Total		*3*	*14*	*17*
Pearson's Chi squared	1.2(d.f.=2)			
t-test	0.1 (df.=2.1)			

Table A12.28: Relationships between Physics teacher gender and the school fees paid per month

	Gender	Male	Female	Total
School fees paid	1	5	0	*5*
	2	3	1	*4*
	3	2	4	*6*
Total		*10*	*5*	*15*
Pearson's Chi squared	5.6 (d.f.=2)			
t-test	2.6* (d.f.=12.7)			

Table A12.29: Relationships between Biology teacher gender and the school fees paid per month

	Gender	Male	Female	Total
School fees paid	1	2	3	*5*
	2	1	3	*4*
	3	1	7	*8*
Total		*4*	*13*	*17*
Pearson's Chi squared	1.3 (d.f.=2)			
t-test	0.7(d.f.=10.11)			

Table A12.30: Relationships between teacher age and other background characteristics (correlations)

	Total sample	Chemistry	Physics	Biology
eacher age/experience	0.9*** (d.f.=42)	0.9*** (d.f.=15)	0.9*** (d.f.=14)	0.8*** (d.f.=17)
Teacher age /years at the establishment	0.7*** (d.f.=37)	0.6* (d.f.=14)	0.8** (d.f.=13)	0.7*** (d.f.=14)
Teacher age /hours working at particular establishment	0.0 (d.f.=36)	0.3 (d.f.=14)	0.1 (d.f.=11)	-0.2 (d.f.=15)
Teacher age /total working hours	0.1 (d.f.=37)	0.3 (d.f.=14)	-0.2 (d.f.=12)	0.3 (d.f.=15)
Teacher age /income per student family member	-	-0.3 (d.f.=13)	0.4 (d.f.=12)	0.1 (d.f.=15)
Teacher age/student age	-	0.3 (d.f.=15)	-0.2 (d.f.=10)	-0.3 (d.f.=17)
Teacher age/student ability	-	-0.1 (d.f.=15)	0.1 (d.f.=14)	-0.2 (d.f.=17)
Teacher age/income per teacher family member	0.2 (d.f.=34)	0.3 (d.f.=13)	0.0 (d.f.=14)	0.4 (d.f.=16)

Table A12.31: Relationships between teacher age and other background characteristics (student t-test and ANOVA)

	Total sample	Chemistry	Physics	Biology
Teacher age /school administration (subsidised)	-0.9(d.f.=26.9)	-1.9 (d.f.=6.7)	-0.1 (d.f.=11.4)	-0.8 (d.f.=8.5)
Teacher age /location of school (Coquimbo)	-2.0* (d.f.=33.9)	-1.5 (10.6)	-1.5 (d.f.=11.3)	-0.5 (d.f.=10.5)
Teacher age /Number of schools in which she works (in one establishment alone)	1.2 (d.f.=33.7)	1.2 (d.f.=10.0)	0.7 (d.f.=10.6)	0.1 (d.f.=3.6)
Teacher age /School fees paid per month	F=0.1 (d.f.=41)	F=0.1 (d.f.=14)	F=0.1 (d.f.=13)	F=0.1 (d.f.=16)

Table A12.32: Relationships between teacher experience and other background characteristics (correlations)

	Total sample	Chemistry	Physics	Biology
Experience /years at the establishment	0.7*** (d.f.=40)	0.6* (d.f.=16)	0.8** (d.f.=14)	0.9*** (d.f.=14)
Experience /hours working at particular establishment	0.2 (d.f.=39)	0.3 (d.f.=16)	0.2 (d.f.=12)	0.2 (d.f.=15)
Experience /total working hours	0.1 (d.f.=40)	0.4 (d.f.=16)	-0.0(d.f.=13)	0.1 (d.f.=15)
Experience /income per student family member	-	-0.4 (d.f.=15)	0.4(d.f.=13)	0.2 (d.f.=15)
Experience/student age	-	0.3 (d.f.=17)	-0.0 (d.f.=15)	-0.3 (d.f.=17)
Experience/student ability	-	-0.2 (d.f.=17)	0.1 (d.f.=15)	0.0 (d.f.=17)
Experience/income per teacher family member	0.2 (d.f.=36)	0.3 (d.f.=15)	-0.2 (d.f.=10)	0.5 (d.f.=16)

Table A12.33: Relationships between teacher experience and other background characteristics (student t-test and ANOVA)

	Total sample	Chemistry	Physics	Biology
Experience/ school administration (subsidised)	-0.5(d.f.=34.8)	-1.8 (d.f.=11.0)	0.5 (d.f.=12.4)	-0.1 (d.f.=11.4)
Experience /location of school (Coquimbo)	-1.6 (d.f.=33.8)	-1.5 (d.f.=14.2)	-1.3 (d.f.=11.7)	-0.3 (d.f.=9.4)
Experience /Number of schools in which she works (in one establishment alone)	1.0 (d.f.=39.2)	1.3 (d.f.=6.6)	-0.6 (d.f.=9.2)	1.6 (d.f.=7.5)
Experience /School fees paid per month	F=0.4 (d.f.=44)	F=0.5 (d.f.=16)	F=0.3 (d.f.=14)	F=0.4 (d.f.=16)

Table A12.34: Relationships between years teacher has been working at establishment and other background characteristics (correlations)

	Total sample	Chemistry	Physics	Biology
Years at establishment /hours working at particular establishment	0.3 (d.f.=37)	0.5 (d.f.=16)	0.2 (d.f.=11)	0.2 (d.f.=14)
Years at establishment /total working hours	0.2 (d.f.=38)	0.5* (d.f.=16)	0.1 (d.f.=12)	0.2 (d.f.=14)
Years at establishment /income per student family member	-	-0.0 (d.f.=14)	0.1 (d.f.=12)	0.0 (d.f.=13)
Years at establishment /student age	-	0.1 (d.f.=16)	0.0 (d.f.=14)	-0.2 (d.f.=14)
Years at establishment /student ability	-	-0.0 (d.f.=16)	0.1 (d.f.=14)	0.2 (d.f.=14)
Years at establishment /income per teacher family member	0.3 (d.f.=33)	0.4 (d.f.=14)	0.2 (d.f.=10)	0.4 (d.f.=13)

Table A12.35: Relationships between years teacher has been working at establishment and other background characteristics (t-tests and ANOVA)

	Total sample	Chemistry	Physics	Biology
Years of service/ school administration (subsidised)	-0.2 (d.f.=38.0)	-1.0 (d.f.=13.4)	0.2 (d.f.=10.0)	-0.3 (d.f.=10.2)
Years of service/location of school (Coquimbo)	-0.5 (d.f.=34.0)	-0.3 (d.f.=11.3)	-0.8 (d.f.=10.3)	-0.3 (d.f.=11.2)
Years of service/Number of schools in which she works (in one establishment alone)	2.2* (d.f.=36.2)	2.1 (d.f.=7.8)	0.7 (d.f.=7.2)	1.4 (d.f.=9.8)
Years of service/School fees paid per month	F=2.3 (d.f.=39)	F=0.0 (d.f.=15)	F=2.0 (d.f.=13)	F=2.3 (d.f.=13)

Table A12.36: Relationships between hours working in the particular establishment and other background characteristics (correlations)

	Total sample	Chemistry	Physics	Biology
Hours working in particular institution /total working hours	0.4** (d.f.=39)	0.6* (d.f.=16)	0.5 (d.f.=12)	0.1 (d.f.=15)
Hours working in particular institution /income per student family member	-	-0.3 (d.f.=14)	0.1 (d.f.=11)	0.2 (d.f.=14)
Hours working in particular institution /Student age	-	0.1 (d.f.=16)	-0.1 (d.f.=12)	-0.1 (d.f.=15)
Hours working in particular institution /student ability	-	-0.0 (d.f.=16)	0.4 (d.f.=12)	0.6* (d.f.=15)
Hours working in particular institution /income per teacher family member	0.2 (d.f.=32)	0.7** (d.f.=14)	-0.1 (d.f.=8)	0.0 (d.f.=14)

Table A12.37: Relationships between hours working in the particular establishment and other background characteristics (t-tests and ANOVA)

	Total sample	Chemistry	Physics	Biology
Hours working in particular institution /administration (subsidised)	-0.7(d.f.=32.0)	-1.8 (d.f.=12.4)	0.5 (d.f.=6.6)	0.5 (d.f.=8.6)
Hours working in particular institution /location of school (Coquimbo)	0.4 (d.f.=20.5)	-0.8 (d.f.=13.1)	0.5 (d.f.=4.0)	0.4 (d.f.=10.7)
Hours working in particular institution /Number of schools in which she works (one institution alone)	2.7* (d.f.=27.5)	4.9*** (d.f.=12.6)	0.5 (d.f.=7.6)	3.1 (d.f.=6.0)
Hours working in particular institution /School fees paid per month	F=0.4 (d.f.=20.5)	F=0.6 (d.f.=15)	F=1.1 (d.f.=11)	F=0.8 (d.f.=14)

Table A12.38: Relationships between total hours worked and other background characteristics (correlations)

	Total sample	Chemistry	Physics	Biology
Total working hours /income per student family member	-	-0.6* (d.f.=14)	-0.4 (d.f.=12)	-0.2 (d.f.=14)
Total working hours /Student age	-	-0.2 (d.f.=16)	0.5 (d.f.=13)	0.1 (d.f.=15)
Total working hours /student ability	-	0.5 (d.f.=16)	0.1 (d.f.=13)	-0.5 (d.f.=15)
Total working hours /income per teacher family member	0.1 (d.f.=32)	0.4 (d.f.=16)	-0.4 (d.f.=8)	0.1 (d.f.=14)

Table A12.39: Relationships between total hours worked and other background characteristics (t-test and ANOVA)

	Total sample	Chemistry	Physics	Biology
Total working hours /administration (subsidised)	-2.7* (d.f.=28.9)	-3.1* (d.f.=10.7)	-1.0 (d.f.=6.9)	-1.6 (d.f.=10.5)
Total working hours /location of school (Coquimbo)	1.8 (d.f.=27.6)	0.4 (d.f.=12.0)	2.1 (d.f.=9.6)	0.8 (d.f.=12.7)
Total working hours /Number of schools in which she works (one institution alone)	-1.1 (d.f.=24.8)	0.3 (d.f.=14.0)	-3.4** (d.f.=9.9)	1.0 (d.f.=4.0)
Total working hours /School fees paid per month	F=3.5* (d.f.=39) A significant difference in group means lies between fee group 1 and 3 (-9.8*)	F=2.2 (d.f.=15)	F=1.7 (d.f.=12)	F=1.0 (d.f.=14)

Table A12.40: Relationships between income per teacher family member and other background characteristics (correlations)

	Total sample	Chemistry	Physics	Biology
Income per teacher family member /income per student family member	-	-0.3 (d.f.=13)	-0.1 (d.f.=8)	-0.2 (d.f.=14)
Income per teacher family member /Student age	-	-0.0 (d.f.=15)	-0.2 (d.f.=10)	-0.2 (d.f.=16)
Income per teacher family member/student ability	-	-0.1 (d.f.=15)	-0.0 (d.f.=10)	-0.0 (d.f.=16)

Table A12.41: Relationships between income per teacher family member and other background characteristics (t-test and ANOVA)

	Total sample	Chemistry	Physics	Biology
Income per teacher family member /administration (subsidised)	-1.3 (d.f.=20.8)	-1.8 (d.f.=6.1)	0.4 (d.f.=4.4)	-0.0 (d.f.=11.5)
Income per teacher family member /location of school (Coquimbo)	0.1 (d.f.=24.0)	-1.1 (d.f.=13.0)	1.5 (d.f.=4.3)	-1.6 (d.f.=10.9)
Income per teacher family member /Number of schools in which she works (one institution alone)	0.5 (d.f.=26.0)	-1.6 (d.f.=5.1)	0.5 (d.f.=5.9)	0.7 (d.f.=10.3)
Income per teacher family member /School fees paid per month	F=0.4 (d.f.=35)	F=0.5 (d.f.=14)	F=0.3 (d.f.=9)	F=0.3 (d.f.=15)

Table A12.42: Relationships between number of schools in which teacher works and other background characteristics (t-test and ANOVA)

	Total sample	Chemistry	Physics	Biology
Number of schools in which she works (in one institution alone /income per student family member	-	0.4 (d.f.=6.1)	2.2 (d.f.=9.1)	2.2* (d.f.=12.0)
Number of schools in which she works /Student age	-	0.5 (d.f.=5.0)	-2.2 (d.f.=5.3)	-0.6 (d.f.=5.1)
Number of schools in which she works /student ability	-	1.1 (d.f.=13.6)	1.0 (d.f.=9.0)	2.2 (d.f.=3.4)

Table A12.43: Relationships between number of schools in which teacher works in the total teacher sample and the administration type of the school

	Number of schools in which teacher works	1	2 or more	Total
School Administration	Municipal	8	7	*15*
	Subsidised	18	9	*27*
Total		*26*	16	42
Pearson's Chi squared	0.7 (d.f.=1)			

Table A12.44 Relationships between number of schools in which Chemistry teacher works and the administration type of the school

	Number of schools in which teacher works	1	2 or more	Total
School Administration	Municipal	2	4	*6*
	Subsidised	3	7	*10*
Total		*5*	*11*	*16*
Pearson's Chi squared	0.0 (d.f.=1)			

Table A12.45: Relationships between number of schools in which Physics teacher works and the administration type of the school

	Number of schools in which teacher works	1	2 or more	Total
School Administration	Municipal	1	4	*5*
	Subsidised	7	2	*9*
Total		*8*	*6*	*14*
Pearson's Chi squared	4.4 (d.f.=1)			

Table A12.46: Relationships between number of schools in which Biology teacher works and the administration type of the school

	Number of schools in which teacher works	1	2 or more	Total
School Administration	Municipal	4	2	*6*
	Subsidised	7	2	*9*
Total		*11*	*4*	*15*
Pearson's Chi squared	0.2 (d.f.=1)			

Table A12.47: Relationships between number of schools in which teacher works in the total teacher sample and the location of the school

	Number of schools in which teacher works	1	2 or more	Total
Location of school	Coquimbo	5	8	*13*
	La Serena	21	8	*29*
Total		*26*	*16*	*42*
Pearson's Chi squared	4.4* (d.f.=1)			

Table A12.48: Relationships between number of schools in which Chemistry teacher works and the location of the school

	Number of schools in which teacher works	1	2 or more	Total
Location of school	Coquimbo	1	5	*6*
	La Serena	4	6	*10*
Total		*5*	*11*	*16*
Pearson's Chi squared	1.0 (d.f.=1)			

Table A12.49: Relationships between number of schools in which Physics teacher works and the location of the school

	Number of schools in which teacher works	1	2 or more	Total
Location of school	Coquimbo	1	4	*5*
	La Serena	7	2	*9*
Total		*8*	*6*	*14*
Pearson's Chi squared	4.4 (d.f.=1)			

Table A12.50: Relationships between number of schools in which Biology teacher works and the location of the school

	Number of schools in which teacher works	1	2 or more	Total
Location of school	Coquimbo	3	3	*6*
Location of school	Coquimbo	3	3	*6*
	La Serena	8	1	*9*
	La Serena	8	1	*9*
Total		*11*	*4*	*15*
Total		*11*	*4*	*15*
Pearson's Chi squared	2.8 (d.f.=1)			
Pearson's Chi squared	2.8 (d.f.=1)			

Table A12.51: Relationship between number of schools in which teacher works in total teacher sample and the school fees paid per month

	Number of schools in which teacher works	1	2 or more	Total
School fees paid	1	10	3	*13*
	2	8	3	*11*
	3	8	10	*18*
Total		*26*	*16*	*42*
Pearson's Chi squared	4.1 (d.f.=2)			
t-test	1.8 (32.0)			

Table A12.52: Relationship between number of schools in which Chemistry teacher works and the school fees paid per month

	Number of schools in which teacher works	1	2 or more	Total
School fees paid	1	1	3	*4*
	2	2	2	*4*
	3	2	6	*8*
Total		*5*	*11*	*16*
Pearson's Chi squared	0.9 (d.f.=2)			
t-test	0.0 (d.f.=9.8)			

Table A12.53: Relationship between number of schools in which Physics teacher works and the school fees paid per month

	Number of schools in which teacher works	1	2 or more	Total
School fees paid	1	4	0	*4*
	2	3	1	*4*
	3	1	5	*6*
Total		*8*	*6*	*14*
Pearson's Chi squared	7.5* (d.f.=2)			
t-test	3.3** (d.f.=11.2)			

Table A12.54: Relationship between number of schools in which Biology teacher works and the school fees paid per month

	Number of schools in which teacher works	1	2 or more	Total
School fees paid	1	5	0	*5*
	2	2	0	*2*
	2	2	0	*2*
	3	4	4	*8*
Total		*11*	*4*	*15*
Total		*11*	*4*	*15*
Pearson's Chi squared	4.8 (d.f.=2)			
Pearson's Chi squared	4.8 (d.f.=2)			
t-test	3.4** (d.f.=12.3)			

A12.2. Relationships between student attitude and belief scales and background characteristics

Table 12.B: Description of results tables of interactions between background characteristics and student attitude and belief scales

Attitude	Attitude to Chemistry class	Attitude to Physics class	Attitude to Biology class	Attitude to Chemistry teacher	Attitude to Physics teacher	Attitude to Biology teacher	Perception of Chemistry teacher's satisfaction	Perception of Physics teacher's satisfaction	Perception of Biology teacher's satisfaction	Science as a career
Father's education	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Mother's education	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
School administration	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Location of school	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
School fees	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Income per student family member	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Student ability	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Student age	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Student gender	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Subject	A12.55	A12.55	A12.55	A12.55	A12.55	A12.55	A12.55	A12.55	A12.55	A12.55
Teacher age	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Teacher experience	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Total hours worked by teacher	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Income per teacher family member	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Hours worked in particular school	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Teacher gender	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56
Number of establishment in which teacher works	A12.63	A12.57	A12.60	A12.64	A12.58	A12.61	A12.65	A12.59	A12.62	A12.56

Table A12.55: Relationship between subject attitude and belief scales of different subjects

Variable	One way ANOVA
Attitude to class	F=50.7
A significant mean difference lies between the attitude to the	Mean difference between groups
Biology class/Chemistry class	0.3***
Chemistry class/ Physics class	0.2**
Biology class/ Physics class	0.5***
Attitude to teacher	F=20.7
A significant mean difference lies between the attitude to the	**Mean difference between groups**
Biology teacher/ Chemistry teacher	0.3***
Chemistry teacher/Physics teacher	0.0
Biology teacher/Physics teacher	0.3***
Attitude to teacher	F=13.6
A significant mean difference lies between:	**Mean difference between groups**
Perception of Biology teacher/Perception of Chemistry teacher	0.2***
Perception of Chemistry teacher/ Perception of Physics teacher	0.1
Perception of Biology teacher/ Perception of Physics teacher	0.2***

Table A12.56: The relationship between student, school and teacher background characteristics and student attitude to science as a career

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Attitude to science as a career	Student age	0.0 (d.f.=537)		
	Location (Coquimbo)*		0.5(d.f.=256.8)	
	Student gender (female)*		2.5* (d.f.=535.6)	
	Father's education			2.4 (d.f.=363)
	Mother's education			0.6 (d.f.=379)
	Student income per family member	0.1 (d.f.=298)		
	School administration (subsidised)*		0.4 (d.f.=433.6)	
	Ability	0.0 (d.f.=490)		
	School fee			2.4 (d.f.=539)
	Biology teacher age	0.2 (d.f.=17)		
	Physics teacher age	0.3 (d.f.=14)		
	Chemistry teacher age	0.1(d.f.=15)		
	Biology teacher experience	0.0 (d.f.=17)		
	Physics teacher experience	0.0 (d.f.=15)		
	Chemistry teacher experience	0.2 (d.f.=17)		
	Total hours worked by Biology teacher	0.3 (d.f.=15)		
	Total hours worked by Physics teacher	-0.4 (d.f.=13)		
	Total hours worked by Chemistry teacher	0.0 (d.f.=16)		
	Biology teacher income per family member	-0.2 (d.f.=16)		
	Physics teacher income per family member	-0.4 (d.f.=10)		
	Chemistry teacher income per family member	0.1 (d.f.=15)		
	Hours worked in particular school by Biology teacher	0.0 (d.f.=15)		
	Hours worked in particular school by Physics teacher	-0.5 (d.f.=12)		
	Hours worked in particular school by Chemistry teacher	-0.1 (d.f.=16)		
	Years that Biology teacher has been at particular school	0.0 (d.f.=14)		
	Years that Physics teacher has been at particular school	0.1(d.f.=14)		
	Years that Chemistry teacher has been at particular school	0.0 (d.f.=16)		
	Biology teacher gender* (female)		-0.5 (d.f.=4.5)	
	Physics teacher gender* (female)		-0.7 (d.f.=6.4)	
	Chemistry teacher gender* (female)		-0.9 (d.f.=6.2)	
	Number of schools in which Biology teacher works* (one establishment only)		0.8 (d.f.=12.0)	
	Number of schools in which Physics teacher works* (one establishment only)		1.3 (d.f.=10.9)	
	Number of schools in which Chemistry teacher works* (one establishment only)		0.2 (d.f.=12.7)	

*The category entered first into the t-test analyses is presented in brackets after the variable name. A positive t statistic indicates that the first category showed the highest attitude or belief mean score

Table A12.57: The relationships of student, school and teacher background characteristics and student attitude to the Physics class

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Attitude to subject	Student age	0.0(d.f.=548)		
	Location (Coquimbo)		-3.1** (d.f.=262.7)	
	Student gender		0.9 (d.f.=547.4)	
	Father's education			0.5 (d.f.=371)
	Mother's education			0.1 (d.f.=387)
	Income per student family member	-0.0 (d.f.=305)		
	School administration (subsidised)		0.8 (d.f.=392.2)	
	Ability	0.1 (d.f.=501)		
	School fee			3.2* (d.f. =550); Individual differences proved not to be significant by the Scheffe test. Alternatively, significant mean differences lie between group 1 and 3 (1.9) when analysed by the Tukey HSD post hoc analysis.
	Teacher age	0.6 (d.f.=14)		
	Experience	0.59* (d.f.=15)		
	Total hours worked by teacher	-0.2 (d.f.=13)		
	Income per teacher family member	-0.5 (d.f.=10)		
	Hours worked in particular school	0.1 (d.f.=12)		
	Years at particular school	0.2 (d.f.=14)		
	Teacher gender (female)		-2.6* (d.f.=8.9)	
	Number of schools in which teacher works		1.7(d.f.=9.2)	

Table A12.58: The relationship between student, school and teacher background characteristics and student attitude to the Physics teacher

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Attitude to Physics teacher	Student age	0.0 (d.f.=545)		
	Location (Coquimbo)		-4.4*** (d.f.=247.8)	
	Student gender		-0.6 (d.f.=545.0)	
	Father's education			2.1 (d.f.=369)
	Mother's education			0.9 (d.f.=385)
	Income per student family member	0.0 (d.f.=303)		
	School administration (subsidised)		-2.9** (d.f.=444.5)	
	Ability	0.1 (d.f.= 492)		
	School fee			29.7*** A significant difference in group means lies between groups 1 and 2 (3.8***) and between groups 2 and 3 (–0.3)
	Teacher age	0.2 (d.f.=14)		
	Experience	0.18 (d.f.=15)		
	Total hours worked by teacher	-0.6* (d.f.=13)		
	Income per teacher family member	0.0 (d.f.=10)		
	Hours worked in particular school	-0.4 (d.f.=12)		
	Years at particular school	-0.2 (d.f.=14)		
	Teacher gender(female)		-1.1 (d.f.=10.0)	
	Number of schools in which teacher works (one school only)		-1.0 (d.f.=10.7)	

Table A12.59: The relationship between student, school and teacher background characteristics upon the perception of the student of the Physics teacher's satisfaction

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Perception of Physics teacher satisfaction	Student age	-0.0 (d.f.=537)		
	Location (Coquimbo)		-3.8*** (d.f.=249.2)	
	Student gender		0.8 (d.f.=535.3)	
	Father's education			0.6 (d.f.=367)
	Mother's education			0.0 (d.f.=383)
	Income per student family member	-0.0 (d.f.=300)		
	School administration (subsidised schools)		1.4 (d.f.=444.5)	
	Ability	0.0 (d.f.=498)		
	School fee			3.3* (d.f.=539) A significant difference in group means lies between groups 1 and 3 (0.9*)
	Teacher age	0.5 (d.f.=14)		
	Experience	0.6* (d.f.=15)		
	Total hours worked by teacher	-0.3 (d.f.=13)		
	Income per teacher family member	-0.4 (d.f.=10)		
	Hours worked in particular school	-0.1 (d.f.=12)		
	Years at particular school	0.3 (d.f.=14)		
	Teacher gender		1.4 (d.f.=8.5)	
	Number of schools in which teacher works		1.6 (d.f.=10.8)	

Table A12.60: The relationship between student, school and teacher background characteristics and student attitude to the Biology class

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Attitude to subject	Student age	-0.0 (d.f.=546)		
	Location (Coquimbo)		3.8 *** (d.f.=264.2)	
	Student gender (female)		4.8*** (d.f.=543.8)	
	Father's education			0.5 (d.f.=371)
	Mother's education			1.4 (d.f.=387)
	Income per student family member	0.1* (d.f.=306) (p=0.05)		
	School administration (subsidised)		2.6* (d.f.=427.6)	
	Ability	0.0 (d.f.=500)		
	School fee			1.4 (d.f.=548)
	Teacher age	-0.2 (d.f.=17)		
	Experience	-0.3 (d.f.=17)		
	Total hours worked by teacher	0.0 (d.f.=15)		
	Income per teacher family member	0.2(d.f.=16)		
	Hours worked in particular school	-0.1 (d.f.=15)		
	Years at particular school	-0.1(d.f.=14)		
	Teacher gender (female)		0.3 (d.f.=3.5)	
	Number of schools in which teacher works (only one school)		1.7 (d.f.=4.5)	

Table A12.61: The relationship between student, school and teacher background characteristics and student attitude to the Biology teacher

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Attitude to Biology teacher	Student age	0.0 (d.f.=545)		
	Location (Coquimbo)		**5.2*** (d.f.=318.4)**	
	Student gender (female)		0.7(d.f.=542.6)	
	Father's education			0.5 (d.f.=368)
	Mother's education			4.2* (d.f.=384) A significant difference in group means lies between groups 1 and 3 (1.5*)
	Income per student family member	0.1* (d.f.=302)		
	School administration (subsidised)		2.0* (d.f.=406.2)	
	Ability	0.0 (d.f.=498)		
	School fee			0.0 (d.f.=547)
	Teacher age	-0.1 (d.f.=17)		
	Experience	-0.1 (d.f.=17)		
	Total hours worked by teacher	0.2(d.f.=15)		
	Income per teacher family member	-0.2 (d.f.=16)		
	Hours worked in particular school	0.0 (d.f.=15)		
	Years at particular school	0.0 (d.f.=14)		
	Teacher gender (female)		0.3 (d.f. .= 6.7)	
	Number of schools in which teacher works (one school only)		1.4 (d.f.=3.9)	

Table A12.62: The relationship betweeen student, school and teacher background characteristics and the perception of the student of the Biology teacher's satisfaction

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Perception of Biology teacher satisfaction	Student age	-0.1* (d.f.=545)		
	Location (Coquimbo)		3.9*** (d.f.=246.682)	
	Student gender (female)		1.2 (d.f.=544.9)	
	Father's education			1.1 (d.f.=370)
	Mother's education			5.4** (d.f.=386) A significant difference in group means lies between groups 1 and 3 (1.2**)
	Income per student family member	0.2** (d.f.=304)		
	School administration (subsidised)		3.9*** (d.f.=246.7)	
	Ability	0.1** (d.f.=499)		
	School fee			10.0***(d.f.=549) A significant difference in group means lies between groups 1 and 3 (0.8*) and groups 2 and 3 (1.4***)
	Teacher age	-0.267 (d.f.=17)		
	Experience	-0.3 (d.f.=17		
	Total hours worked by teacher	-0.1 (d.f.=15)		
	Income per teacher family member	-0.2 (d.f.=16)		
	Hours worked in particular school	0.2 (d.f.=15)		
	Years at particular school	-0.1 (d.f.=14)		
	Teacher gender (female)		0.7 (d.f.=4.1)	
	Number of schools in which teacher works (one school only)		0.6 (d.f.=3.7)	

Table A12.63: The relationship beetween student, school and teacher background characteristics upon student attitude to the Chemistry class

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Attitude to subject	Student age	-0.1 (d.f.=544)		
	Location (Coquimbo)		2.7** (d.f.=256.8)	
	Student gender (female)		1.8 (d.f.=543.4)	
	Father's education			1.1 (d.f.=368)
	Mother's education			0.3 (d.f.=384)
	Student family income/number in family unit	-0.1 (d.f.=304)		
	School administration (subsidised)		0.3 (d.f.=371.0)	
	Ability	0.1 (d.f.=499)		
	School fee			0.3 (d.f.=546)
	Teacher age	-0.1 (d.f.=15)		
	Experience	-0.1 (d.f.=16)		
	Total hours worked by teacher	0.5 (d.f.=16)		
	Income per teacher family member	0.2 (d.f.=15)		
	Hours worked in particular school	0.2 (d.f.=16)		
	Years at particular school	0.2 (d.f.=16)		
	Teacher gender (female)		3.0* (d.f.=14.6)	
	Number of schools in which teacher works		0.2 (d.f.=12.6)	

Table A12.64: The relationship between student, school and teacher background characteristics and student attitude to the Chemistry teacher

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Attitude to Chemistry teacher	Student age	-0.1* (d.f.=542)		
	Location (Coquimbo)		0.22 (d.f.=262.4)	
	Student gender (female)		3.4** (d.f.=541.2)	
	Father's education			2.5 (d.f.=366)
	Mother's education			1.8 (d.f.=382)
	Income per student family member	-0.1 (d.f.=501)		
	School administration (subsidised)		0.3 (d.f.=354.5)	
	Ability	-0.0 (d.f.=496)		
	School fee			1.9 (d.f.=544)
	Teacher age	0.1 (d.f.=15)		
	Experience	0.0 (d.f.=17)		
	Total hours worked by teacher	0.4 (d.f.=16)		
	Income per teacher family member	0.3 (d.f.=15)		
	Hours worked in particular school	0.3 (d.f.=16)		
	Years at particular school	0.2 (d.f.=16)		
	Teacher gender		1.4 (d.f.=7.7)	
	Number of schools in which teacher works		0.7 (d.f.=11.1)	

Table A12.65: The relationship between student, school and teacher background characteristics and the perception of the student of the Chemistry teacher's satisfaction

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Perception of Chemistry teacher satisfaction	Student age	-0.1* (d.f.=541)		
	Location (Coquimbo)		0.7 (d.f.=280.5)	
	Student gender (female)		3.2** (d.f.=540.8)	
	Father's education			0.1 (d.f.=366)
	Mother's education			0.7 (d.f.=382)
	Income per student family member	0.0 (d.f.=299)		
	School administration (subsidised)		3.7*** (d.f.=337.9)	
	Ability	0.1** (d.f.=496)		
	School fee			3.7* (d.f. =543). A significant difference in group means lies between groups 2 and 3 (0.9)
	Teacher age	-0.1 (d.f.=15)		
	Experience	-0.3 (d.f.=17)		
	Total hours worked by teacher	0.1 (d.f.=16)		
	Income per teacher family member	0.1 (d.f.=15)		
	Hours worked in particular school	0.0 (d.f.=16)		
	Years at particular school	0.0 (d.f.=16)		
	Teacher gender (female)		0.2 (d.f.=8.1)	
	Number of schools in which teacher works (one school only)		1.0 (d.f.=14.0)	

A12.3. Relationships between achievement scores and background characteristics

Table 12.C: Description of results tables of interactions between background characteristics and student achievement scores

Attitude	Independent Chemistry test score	Independent Physics test score	Independent Biology test score	Chemistry Term mark	Physics Term mark	Biology Term mark
Father's education	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Mother's education	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
School administration	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Location of school	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
School fees	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Income per student family member	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Student ability	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Student age	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Student gender	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Subject	A12.66	A12.66	A12.66	A12.67	A12.67	A12.67
Teacher age	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Teacher experience	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Total hours worked by teacher	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Income per teacher family member	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Hours worked in particular school	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Teacher gender	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69
Number of establishment in which teacher works	A12.70	A12.72	A12.68	A12.71	A12.73	A12.69

Table A12.66: Comparison of independent test scores between subjects

Variable	F values and associated mean differences
F Value	44.9*** (d.f.=1615)
Mean differences lie between:	
Biology score/Physics score	0.6***
Chemistry score/ Physics score	1.3***
Chemistry score/Biology score	0.7***

Table A12.67: Comparison of term marks between subjects

Variable	F values and associated mean differences
F value	15.4***
Mean differences lie between:	
Biology term mark/ Physics term mark	0.3***
Chemistry term mark/ Physics term mark	0.3***
Chemistry term mark/Biology term mark	0.0

Table A12.68: The relationship between student, school and teacher background characteristics and Biology independent test scores

Dependent variable	**Independent background variable**	**Correlation**	**T-test (t value)**	**ANOVA (F value)**
Biology independent test score	Student age	-0.2*** (d.f.=525)		
	Location (Coquimbo)		2.6** (d.f.=287.7)	
	Student gender (female)		0.6 (d.f.=529.0)	
	Father's education			14.9*** (d.f.=348) A significant difference in group means lies between group 1 and 2 (0.9*) and group1 and 3 (1.7***)
	Mother's education			11.4*** (d.f.=363) A significant difference in group means lies between group 1 and 3 (1.4***) and groups 2 and 3 (1.1**)
	Income per student family member	0.3*** (d.f.=290)		
	School administration (subsidised)		10.3*** (d.f.=393.8)	
	Ability	0.4*** (d.f=471)		
	School fee			48.0*** (d.f.=536) A significant difference in group means lies between groups 1 and 3 (1.9***) and groups 2 and 3 (2.1***)
	Teacher age	-0.2 (d.f.=17)		
	Experience	-0.1 (d.f.=17)		
	Total hours worked by teacher	-0.4 (d.f.=15)		
	Income per teacher family member	-0.2 (d.f.=16)		
	Hours worked in particular school	0.268 (d.f.=15)		
	Years at particular school	0.0 (d.f.=14)		
	Teacher gender (female)		-0.7 (d.f.=4.6)	
	Number of schools in which teacher works (one school only)		01.5 (d.f.=5.7)	

Table A12.69: The relationship between student, school and teacher background characteristics and Biology term marks

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Biology term marks	Student age	-0.1*** (d.f.=576)		
	Location (Coquimbo)		-2.0* (d.f.=322.2)	
	Student gender (female)		4.7*** (d.f.=579.7)	
	Father's education			2.5 (d.f.=389)
	Mother's education			2.6 (d.f.=406)
	Income per student family member	0.1 (d.f.=320)		
	School administration (subsidised)		1.9 (d.f.=372.1)	
	Ability	0.1** (d.f.=520)		
	School fee			5.4** (d.f.=598) A significant difference in group means lies between groups 1 and 2 (0.3**).
	Teacher age	-0.2 (d.f.=17)		
	Experience	-0.4 (d.f.=17)		
	Total hours worked by teacher	-0.4 (d.f.=15)		
	Income per teacher family member	-0.1 (d.f.=16)		
	Hours worked in particular school	-0.2 (d.f.=15)		
	Years at particular school	-0.3 (d.f.=14)		
	Teacher gender (female)		1.8 (d.f.=5.9)	
	Number of schools in which teacher works (one school only)		-0.7(d.f.=3.7)	

Table A12.70: The relationship between student, school and teacher background characteristics and Chemistry independent test scores

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Chemistry independent test score	Student age	-0.1* (d.f.=529)		
	Location (Coquimbo)		-0.9 (d.f.=321.1)	
	Student gender (female)		-0.7 (d.f.=530.7)	
	Father's education			11.2*** (d.f.=352) A significant difference in group means lies between groups between group 1 and 3 (1.0***)
	Mother's education			5.2** (d.f.=367) A significant difference in group means lies between groups 1 and 3 (1.0**)
	Income per student family member	0.2*** (d.f.=295)		
	School administration (subsidised)		5.7*** (d.f.=418.5)	
	Ability	0.3*** (d.f.=475)		
	School fee			15.4*** (d.f.=539) A significant difference in group means lies between groups 1 and 3 (1.1***) and groups 2 and 3 (1.2***)
	Teacher age	0.1 (d.f.=15)		
	Experience	-0.1 (d.f.=17)		
	Total hours worked by teacher	-0.4 (d.f.=16)		
	Income per teacher family member	0.1 (d.f.=15)		
	Hours worked in particular school	0.1 (d.f.=16)		
	Years at particular school	0.2 (d.f.=16)		
	Teacher gender (female)		-0.9 (d.f.=10.7)	
	Number of schools in which teacher works (one school only)		2.4* (d.f.=11.3)	

Table A12.71: The relationship between student, school and teacher background characteristics and Chemistry term marks

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Chemistry term mark	Student age	-0.2*** (d.f.=576)		
	Location (Coquimbo)		-3.7*** (d.f.=293.4)	
	Student gender (female)		1.1 (d.f.=578.9)	
	Father's education			1.7 (d.f.=388)
	Mother's education			1.4 (d.f.=405)
	Income per student family member	0.048 (d.f.=319)		
	School administration (subsidised)		4.2*** (d.f.=442.2)	
	Ability	0.2*** (d.f.=519)		
	School fee			3.9** (d.f.=598) A significant difference in group means lies between groups 1 and 3 (0.2*)
	Teacher age	-0.0 (d.f.=15)		
	Experience	-0.0 (d.f.=17)		
	Total hours worked by teacher	0.1(d.f.=16)		
	Income per teacher family member	0.1(d.f.=15)		
	Hours worked in particular school	0.2 (d.f.=16)		
	Years at particular school	0.2 (d.f.=16)		
	Teacher gender (female)		2.1 (d.f.=9.9)	
	Number of schools in which teacher works (one school only)		1.1(d.f.=13.1)	

Table A12.72: The relationship between student, school and teacher background characteristics and Physics independent test scores

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Physics independent test score	Student age	-0.2** (d.f.=527)		
	Location (Coquimbo)		-2.3* (d.f.=331.3)	
	Student gender (female)		-1.5 (d.f.=529.6)	
	Father's education			2.6 (d.f.=353)
	Mother's education			1.1 (d.f.=368)
	Income per student family member	0.1 (d.f.=294)		
	School administration (subsidised)		2.3* (d.f.=393.5)	
	Ability	0.2*** (d.f.=473)		
	School fee			5.0** (d.f.=538) A significant difference in group means lies between groups 1 and 3 (0.6*)
	Teacher age	0.2 (d.f.=14)		
	Experience	0.3 (d.f.=15)		
	Total hours worked by teacher	-0.1 (d.f.=13)		
	Income per teacher family member	0.0 (d.f.=10)		
	Hours worked in particular school	0.4 (d.f.=12)		
	Years at particular school	0.4 (d.f.=14)		
	Teacher gender (female)		-0.8 (d.f.=8.1)	
	Number of schools in which teacher works (one school only)		3.2** (d.f.=12.1)	

Table A12.73: The relationship between student, school and teacher background characteristics and Physics term marks

Dependent variable	Independent background variable	Correlation	T-test (t value)	ANOVA (F value)
Physics term mark	Student age	-0.1** (d.f.=578)		
	Location (Coquimbo)		-0.9 (d.f.=328.2)	
	Student gender (female)		2.1* (d.f.=573.2)	
	Father's education			2.6 (d.f.=389)
	Mother's education			1.0 (d.f.=367)
	Income per student family member	0.1* (d.f.=320)		
	School administration (subsidised)		1.6 (d.f.=492.3)	
	Ability	0.2*** (d.f.=522)		
	School fee			12.5*** (d.f.=600) A significant difference in group means lies between groups 1 and 2 (0.5***) and group1 and 3 (0.5***)
	Teacher age	-0.2 (d.f.=14)		
	Experience	-0.1 (d.f.=15)		
	Total hours worked by teacher	0.3 (d.f.=13)		
	Teacher family income/number in family unit	-0.2 (d.f.=10)		
	Hours worked in particular school	0.3 (d.f.=12)		
	Years at particular school	-0.3 (d.f.=14)		
	Teacher gender (female)		-1.2 (d.f.=11.3)	
	Number of schools in which teacher works (one school only)		-0.1 (d.f.=11.0)	

A12.4. Relationships between teacher attitude scales and background characteristics

Table 12.D: Description of results tables of interactions between background characteristics and teacher overall job satisfaction and job characteristic scale

Background characteristic	Job characteristic and overall job satisfaction scales
Father's education	-
Mother's education	-
School administration	A12.78
Location of school	A12.78
School fees	A12.78
Income per student family member	A12.75
Student ability	A12.75
Student age	A12.75
Student gender	-
Subject	A12.74
Teacher age	A12.76
Teacher experience	A12.76
Total hours worked by teacher	A12.77
Income per teacher family member	A12.76
Hours worked in particular school	A12.77
Years of service	A12.77
Teacher gender	A12.79
Number of establishment in which teacher works	A12.79

Table A12.74: Comparison of overall and job component scales by subject

Variable	One way ANOVA (F value)
Administrative responsibility (reward)	0.4 (d.f.=34)
Administrative responsibility (value)	0.9 (d.f.=34)
Career advancement (reward)	1.0 (d.f.=39)
Career advancement (value)	2.5 (d.f.=43)
School and Community relations (reward)	0.0 (d.f.=45)
School and Community relations (value)	0.1 (d.f.=46)
Management and morale (reward)	0.8 (d.f.=41)
Management and morale (value)	0.6 (d.f.=40)
Material rewards (reward)	0.7 (d.f.=41)
Material rewards (value)	1.2 (d.f.=41)
Personal and professional development (reward)	0.6 (d.f.=35)
Personal and professional development (value)	1.5 (d.f.=34)
Physical working conditions (reward)	0.9 (d.f.=45)
Physical working conditions (value)	0.4 (d.f.=47)
Relationship with colleagues (reward)	0.1 (d.f.=42)
Relationship with colleagues (value)	0.3 (d.f.=44)
Responsibility for student progress (reward)	0.1 (d.f.=40)
Responsibility for student progress (value)	2.1 (d.f.=39)
Relationship with students (reward)	1.7 (d.f.=45)
Relationship with students (value)	2.6 (d.f.=44)
Work content (reward)	0.9 (d.f.=47)
Work content (value)	2.2 (d.f.=47)
Work load (reward)	0.1 (d.f.=44)
Work load (value)	0.3 (d.f.=44)
Overall job satisfaction	0.2 (d.f.=46)

Table A12.75: Relationships between student characteristics and teacher beliefs, values and overall satisfaction

Characteristics	Student age			Student ability			Income per student family member		
	Chemistry (d.f.=17)	Physics (d.f.=15)	Biology (d.f.=17)	Chemistry (d.f.=17)	Physics (d.f.=15)	Biology (d.f.=17)	Chemistry (d.f.=15)	Physics (d.f.=13)	Biology (d.f.=15)
Administrative responsibility (reward)	0.1	0.2	-0.2	-0.2	-0.0	0.2	-0.4	0.1	0.3
Administrative responsibility (value)	-0.2	0.3	-0.2	0.3	0.2	0.1	0.1	-0.1	0.1
Career advancement (reward)	-0.1	0.2	-0.1	0.0	0.4	0.3	-0.3	0.2	0.3
Career advancement (value)	-0.2	.2	0.2	0.3	-0.2	-0.3	0.2	0.0	-0.2
School and Community relations (reward)	-0.6*	0.3	-0.6*	0.2	0.2	0.6**	-0.0	0.0	0.4
School and Community relations (value)	-0.2	.1	0.2	-0.1	0.0	-0.3	-0.0	-0.1	0.0
Management and morale (reward)	-0.0	0.2	-0.4	0.1	0.4	0.2	0.1	0.4	0.2
Management and morale (value)	0.2	.3	0.2	-0.3	-0.1	-0.1	-0.2	0.1	-0.2
Material rewards (reward)	-0.2	0.3	-0.4	0.4	0.5	0.3	0.1	0.4	0.3
Material rewards (value)	0.1	.2	0.2	0.2	0.0	-0.3	0.1	0.1	-0.2
Personal and professional development (reward)	0.2	0.4	-0.1	0.1	0.3	0.4	-0.2	0.5	0.4
Personal and professional development (value)	0.3	.3	0.2	-0.1	-0.1	-0.2	-0.1	0.1	0.0
Physical working conditions (reward)	-0.3	0.2	-0.3	0.3	0.4	0.4	0.0	0.1	0.3
Physical working conditions (value)	-0.5	.2	0.1	-0.2	-0.2	-0.2	0.0	0.01	0.1
Relationship with colleagues (reward)	-0.1	0.2	0.0	0.0	0.2	-0.2	-0.2	0.4	-0.2
Relationship with colleagues (value)	-0.0	.1	0.0	0.4	0.3	-0.1	0.1	0.0	-0.1
Responsibility for student progress (reward)	0.3	0.3	-0.0	-0.2	-0.1	0.1	-0.5	-0.1	0.1
Responsibility for student progress (value)	0.0	.0	0.1	0.2	0.2	-0.2	-0.1	0.2	-0.0
Relationship with students (reward)	0.1	0.2	-0.6*	-0.1	0.1	0.2	-0.2	0.3	0.3
Relationship with students (value)	0.1	0.1	0.2	0.0	0.2	-0.1	0.3	0.5	0.0
Work content (reward)	0.4	.3	0.2	-0.1	-0.2	-0.2	-0.1	0.0	-0.4
Work content (value)	0.3	.2	0.0	-0.2	0.0	-0.3	0.0	0.2	-0.2
Work load (reward)	0.1	0.1	0.1	-0.03	0.2	-0.0	-0.1	0.1	-0.3
Work load (value)	0.2	0.4	0.2	0.2	0.2	0.0	0.1	0.5	0.0
Overall job satisfaction	0.0	.3	-0.3	0.2	0.5	0.3	-0.1	0.5	-0.0

Table A12.76: Relationships between teacher characteristics and teacher beliefs, values and overall satisfaction

Characteristics	Teacher age				Teacher experience				Income per teacher family income			
	Total sample (d.f.=42)	Chemistry (d.f.=15)	Physics (d.f.=14)	Biology (d.f.=17)	Total sample (d.f.=45	Chemistry (d.f.=17)	Physics (d.f.=15)	Biology (d.f.=17)	Total sample (d.f.=36)	Chemistry (d.f.=15	Physics (d.f.=10)	Biology (d.f.=16)
Administrative responsibility (reward)	0.2	0.1	0.3	-0.1	0.3	0.4	0.3	0.0	0.3	0.1	0.7*	0.3
Administrative responsibility (value)	0.2	0.0	0.2	-0.1	0.2	0.1	0.1	0.1	0.0	-0.4	0.4	0.1
Career advancement (reward)	0.0	-0.3	0.3	-0.1	0.1	-0.2	0.3	-0.0	-0.1	0.2	-0.5	-0.0
Career advancement (value)	0.0	-0.1	0.3	-0.1	-0.1	-0.2	0.2	0.0	-0.1	-0.3	0.1	0.2
School and Community relations (reward)	-0.0	0.0	-0.1	0.1	0.0	0.1	-0.0	0.1	0.1	0.5	-0.3	0.3
School and Community relations (value)	0.0	-0.1	0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.4	0.4	-0.1
Management and morale (reward)	0.1	-0.2	0.2	0.2	0.1	-0.0	0.1	0.2	-0.3	-0.2	-0.5	0.1
Management and morale (value)	0.0	-0.2	0.3	-0.2	0.1	0.1	0.1	-0.2	-0.2	-0.6*	0.2	-0.2
Material rewards (reward)	0.3*	-0.1	0.5	0.1	0.3	-0.0	0.3	0.20	-0.1	-0.0	-0.6	0.1
Material rewards (value)	0.1	-0.3	0.3	-0.1	-0.1	-0.4	0.1	-0.2	-0.3	-0.4	0.1	-0.4
Personal and professional development (reward)	0.2	0.2	0.4	-0.3	0.3*	0.4	0.4	-0.1	0.227	0.1	.9**	-0.3
Personal and professional development (value)	0.2	-0.0	0.4	-0.1	0.1	0.0	0.3	-0.1	-0.2	0.7**	0.0	-0.0
Physical working conditions (reward)	0.2	0.5*	-0.0	0.3	0.3*	0.5	0.2	0.3	0.1	0.4	-0.3	0.4
Physical working conditions (value)	-0.1	-0.4	0.0	-0.0	-0.1	-0.3	0.2	-0.1	0.2	-0.1	0.4	0.2
Relationship with colleagues (reward)	0.1	-0.5	0.3	-0.1	0.1	-0.3	0.3	-0.0	0.0	-0.1	-0.3	0.4
Relationship with colleagues (value)	0.0	-0.1	0.1	-0.2	0.0	-0.1	0.1	-0.0	-0.0	-0.4	0.3	0.3
Responsibility for student progress (reward)	0.1	0.3	0.1	-0.2	0.2	0.5*	0.2	-0.1	0.3	0.3	0.5	0.1
Responsibility for student progress (value)	0.2	0.347	0.4	-0.1	0.2	0.4	0.3	-0.0	0.1	0.3	-0.0	0.1
Relationship with students (reward)	0.2	0.3	0.2	0.3	0.1	0.2	0.1	0.1	-0.2	-0.2	-0.3	0.1
Relationship with students (value)	-0.1	-0.2	0.2	0.1	-0.1	-0.3	0.1	0.1	-0.4**	0.9***	0.3	-0.1
Work content (reward)	0.1	-0.0	0.2	0.2	0.1	0.0	0.2	0.1	-0.2	-0.2	-0.4	0.3
Work content (value)	-0.0	-0.2	0.2	0.1	0.0	-0.1	0.4	0.0	-0.3	-0.6*	-0.4	0.3
Work load (reward)	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.1	0.1	-0.4	0.3	0.5
Work load (value)	-0.1	-0.0	0.2	-0.6*	-0.1	-0.1	0.3	0.7**	-0.2	-0.6*	0.3	-0.3
Overall job satisfaction	0.3	0.0	0.3	0.1	0.3*	0.2	0.4	0.1	-0.1	0.1	-0.5	0.2

Table A12.77: Relationships between teacher and school characteristics and teacher beliefs, values and overall satisfaction

Characteristics	Total hours worked by teacher				Hours worked in particular school				Years at particular school			
	Total sample (d.f.=40)	Chemistry (d.f.=16)	Physics (d.f.=13)	Biology (d.f.=15)	Total sample (d.f.=39)	Chemistry (d.f.=16)	Physics (d.f.=12)	Biology (d.f.=15)	Total sample (d.f.=40)	Chemistry (d.f.=16)	Physics (d.f.=14)	Biology (d.f.=14)
Administrative responsibility (reward)	0.1	0.5	-0.5	0.2	0.3	0.6**	0.1	0.2	0.1	0.3	0.1	-0.2
Administrative responsibility (value)	0.0	0.1	-0.3	0.1	-0.0	0.1	0.1	0.1	0.1	0.2	0.1	-0.0
Career advancement (reward)	0.1	-0.0	0.5	-0.1	0.3	0.2	0.8**	-0.0	-0.1	0.4	0.2	-0.1
Career advancement (value)	0.1	-0.1	0.2	0.3	-0.1	-0.3	-0.2	-0.1	0.0	-0.1	0.2	-0.1
School and Community relations (reward)	0.1	0.0	0.2	-0.2	0.3	0.3	0.6*	0.2	-0.0	0.0	-0.1	0.1
School and Community relations (value)	0.1	0.1	0.4	-0.2	-0.1	-0.2	0.4	-0.6	0.2	0.3	0.2	-0.1
Management and morale (reward)	-0.0	-0.4	0.1	-0.0	0.2	0.1	0.6*	0.2	0.0	-0.2	0.1	0.0
Management and morale (value)	0.1	-0.2	0.3	0.2	0.1	0.1	0.0	-0.3	-0.0	-0.1	0.1	-0.0
Material rewards (reward)	-0.1	-0.4	0.0	-0.1	0.1	0.1	0.4	0.1	0.2	-0.1	0.3	0.1
Material rewards (value)	0.0	-0.1	0.2	-0.1	-0.1	-0.3	-0.1	-0.3	0.1	-0.1	0.2	-0.3
Personal and professional development (reward)	-0.3*	-0.1	-0.5	-0.3	-0.0	0.2	0.2	0.3	0.1	0.2	0.2	-0.2
Personal and professional development (value)	0.1	-0.2*	0.2	0.4	-0.1	-0.4	0.1	-0.1	0.0	-0.1	0.3	0.0
Physical working conditions (reward)	0.2	0.0	0.4	0.0	0.2	0.4	0.4	0.2	0.2	0.1	0.1	0.3
Physical working conditions (value)	0.3	0.1	0.4	0.5	0.0	-0.1	-0.1	0.1	0.1	0.0	0.3	-0.0
Relationship with colleagues (reward)	0.1	-0.2	0.2	-0.1	0.1	0.0	0.5	-0.1	-0.2	-0.5*	0.1	-0.3
Relationship with colleagues (value)	0.1	-0.1	0.5	-0.3	0.0	0.0	0.4	-0.3	0.1	0.2	0.1	-0.2
Responsibility for student progress (reward)	-0.2	0.3	-0.4	-0.3	-0.1	0.6*	0.1	-0.4	-0.0	0.1	0.0	-0.2
Responsibility for student progress (value)	-0.0	0.1	0.0	-0.1	-0.2	0.4	0.2	-0.4	0.0	0.4	0.2	-0.2
Relationship with students (reward)	-0.1	-0.2	-0.4	0.4	0.0	-0.1	-0.1	0.2	0.1	0.1	0.1	-0.0
Relationship with students (value)	-0.0	-0.2	-0.1	0.3	-0.1	-0.3	-0.2	-0.1	0.1	0.0	0.3	0.2
Work content (reward)	-0.1	-0.1	-0.0	-0.1	0.0	-0.1	0.2	-0.4	0.1	0.1	0.0	0.2
Work content (value)	-0.1	-0.1	0.2	-0.3	0.02	-0.2	0.5	-0.5	0.1	0.0	0.2	-0.1
Work load (reward)	-0.2	-0.4	-0.5	0.3	-0.2	-0.5*	-0.1	0.3	-0.2	-0.5*	-0.1	0.0
Work load (value)	-0.2	-0.3	-0.2	-0.1	0.0	-0.2	0.3	-0.1	0.0	-0.1	0.3	.8***
Overall job satisfaction	0.0	0.0	0.0	-0.2	0.2	0.2	0.7**	0.0	0.2	-0.1	0.2	0.2

Table A12.78: Relationships between school characteristics and teacher beliefs, values and overall satisfaction

Characteristics	ocation of school (Coquimbo)				dministration (subsidised)				School fee paid per month (F value)			
	Total sample	Chemistry	Physics	Biology	Total sample	Chemistry	Physics	Biology	Total sample (d.f.=44)	Chemistry (d.f.=16)	Physics (d.f.=14)	Biology (d.f.=16)
Administrative responsibility (reward)	.1 (d.f.=1	7.1 (d.f.=9.0	0.7 (d.f.=4.	7.0 (d.f.=9.6	.8 d.f.=26.1)	0.9 d.f.=10.6	0.8 d.f.=6.1)	.1 d.f.=9.5)	.5	0.8	.8	.0
Administrative responsibility (value)	0.4 d.f.=17.7)	0.1 d.f.=8.8)	-1.3 (d.f.=4.9)	.2 d.f.=8.5)	0.2 d.f.=21.6)	.8 d.f.=5.6)	0.3 d.f.=6.6)	.9 d.f.=9.5)	0.3	0.2	0.3	0.2
Career advancement (reward)	.1 d.f.=17.9)	0.6 d.f.=8.7)	0.3 d.f.=7.2)	.3 d.f.=6.8)	1.2 d.f.=33.1)	.4 d.f.=11.8	.1 d.f.=7.5)	.3 d.f.=13.3)	.4	.8	.5	.1
Career advancement (value)	.3 d.f.=35.8)	.6 d.f.=14.9)	.6 d.f.=9.5)	.6 d.f.=13.4)	0.8 d.f.=18.1)	.5 d.f.=5.8)	1.7 d.f.=12.9)	0.1 d.f.=8.3)	.3	.1	.5	.3
School and Community relations (reward)	1.3 d.f.=18.7)	3.0* d.f.=9.7)	0.5 d.f.=7.3)	0.9 d.f.=6.7)	0.360 d.f.=23.1)	0.4 d.f.=6.9)	.5 d.f.=5.4)	.6 d.f.=10.2)	.1	.2	.1	.3
School and Community relations (value)	.4 (d.f.=24	.4 d.f.=12.0)	.8 d.f.=12.0)	0.3 d.f.=8.3)	0.3 d.f.=28.5)	.3 d.f.=7.7)	0.7 d.f.=12.9)	.3 d.f.=8.3)	.1	.0	.0	.3
Management and morale (reward)	1.6 d.f.=18.4)	0.9 d.f.=7.8)	1.3 d.f.=8.0)	1.0 d.f.=7.1)	0.291 d.f.=28.4)	.3 d.f.=10.9	.0 d.f.=6.4)	.7 d.f.=8.1)	.7	.2	.8	.1
Management and morale (value)	.8 d.f.=39.1)	.9 d.f.=14.6)	.4 d.f.=9.3)	0.5 d.f.=6.9)	.0 d.f.=41.8)	0.5 d.f.=14.3	1.5 d.f.=10.7)	.2 d.f.=8.7)	.2	.8	.5	.9
Material rewards (reward)	0.8 d.f.=21.4)	1.1 d.f.=6.9)	1.5 d.f.=10.8)	.7 d.f.=9.4)	.4* d.f.=39.3)	.5 d.f.=11.6	.9 d.f.=11.8)	.7 d.f.=14.8)	0.4	2.9	1.0	0.09
Material rewards (value)	.4 d.f.=34.4)	(d.f.=14.7)	0.7 (d.f.=11.4)	-1.0 (d.f.=6.0)	.6 d.f.=38.4)	.8 d.f.=6.6)	1.0 d.f.=11.2)	1.7 d.f.=10.0)	0.5	0.0	0.6	0.74
Personal and professional development (reward)	.3 d.f.=18.4)	-0.3 (d.f.=8.4)	-0.3 (d.f.=5.4)	-0.0 (d.f.=7.7)	0.1 d.f.=23.8)	0.2 d.f.=8.2)	.6 d.f.=6.1)	.0 d.f.=10.2)	0.1	0.1	1.9	0.02
Personal and professional development (value)	.1* d.f.=40.1)	1.6 (d.f.=12.6)	0.6 (d.f.=11.9)	2.4* (d.f.=13.5)	.1 d.f.=24.8)	.6 d.f.=5.5)	2.3* d.f.=9.0	.4 d.f.=10.1)	0.1	0.3	0.6	0.48
Physical working conditions (reward)	0.9 d.f.=17.5)	-3.2** (d.f.=14.5)	-0.1 (d.f.=5.9)	-0.8 (d.f.=7.1)	0.9 d.f.=36.0)	.3 d.f.=11.7	.2 d.f.=7.6)	.6 d.f.=13.7)	0.7	1.3	0.0	0.7
Physical working conditions (value)	.8 d.f.=33.8)	0.4 (d.f.=14.8)	4.2** (d.f.=8.0)	0.0 (d.f.=11.5)	.0 d.f.=25.0)	.2 d.f.=6.2)	0.4 d.f.=8.2)	0.4 d.f.=12.5)	0.3	0.5	0.3	0.3

Table A12.78 (continued)

Relationship with colleagues (reward)	0.6 d.f.=24.4)	-0.6 (d.f.=7.6)	-0.2 (d.f.=10.5	-0.4 (d.f.=9.5)	.8 d.f.=30.2)	0.3 d.f.=8.7)	.6 d.f.=8.2)	0.3 d.f.=10.1)	1.6	1.4	1.0	1.0
Relationship with colleagues (value)	.5 d.f.=25.5)	0.7 (d.f.=13.9	1.0 (d.f.=11.8	-1.1 (d.f.=7.5)	0.1 d.f.=31.7)	.3 d.f.=6.4)	0.5 d.f.=12.7)	0.2 d.f.=13.2)	0.2	0.8	0.4	0.5
Responsibility for student progress (reward)	0.7 d.f.=20.8)	-1.0 (d.f.=14.7	-0.2 (d.f.=6.0)	-0.6 (d.f.=8.1)	.5 d.f.=25.3)	1.9 d.f.=8.8)	0.6 d.f.=6.4)	.5 d.f.=10.5)	2.7	1.6	1.2	0.1
Responsibility for student progress (value)	.3 d.f.=31.3)	-0.2 (d.f.=14.4	-0.1 (d.f.=11.9	0.4 (d.f.=13.5	.5 d.f.=23.1)	1.0 d.f.=13.5)	0.6 d.f.=13.0)	.3 d.f.=7.0)	0.4	1.5	0.6	0.2
Relationship with students (reward)	1.2 d.f.=18.9)	-0.8 (d.f.=11.9	-1.2 (d.f.=5.9)	-0.2 (d.f.=12.1	1.1 d.f.=27.4)	0.7 d.f.=12.0)	.3 d.f.=10.9)	.8 d.f.=6.6)	1.0	1.4	2.7	1.9
Relationship with students (value)	.9 d.f.=41.7)	1.3 (d.f.=13.3	0.8 (d.f.=11.9	-0.3 (d.f.=10.4	0.9 d.f.=21.0)	.6 d.f.=7.7)	.8 d.f.=6.1)	0.3 d.f.=10.1)	0.3	0.1	0.6	1.1
Work content (reward)	1.1 d.f.=22.6)	2.0 (d.f.=15.0	-1.3 (d.f.=4.5)	-2.2 (d.f.=9.5)	.6 d.f.=37.9)	1.4 d.f.=13.2)	0.7 d.f.=11.0)	1.4 d.f.=13.6)	0.6	1.1	0.4	0.3
Work content (value)	1.6 d.f.=23.2)	0.3 (d.f.=13.1	-0.9 (d.f.=5.1)	-2.4 (d.f.=5.6)	.7 d.f.=36.5)	0.6 d.f.=12.6)	.3 d.f.=9.9)	1.3 d.f.=15.0)	0.2	0.9	1.7	0.4
Work load (reward)	0.9 d.f.=18.2)	-1.3 (d.f.=8.5	-1.1 (d.f.=4.7)	1.5 (d.f.=13.1	.0 d.f.=39.0)	.4 d.f.=12.5)	.5 d.f.=12.1)	.1 d.f.=13.2)	2.4	1.2	3.6	0.5
Work load (value)	.0 d.f.=26.9)	0.3 (d.f.=14.0	0.8 (d.f.=8.9)	-1.6 (d.f.=13.7	1.0 d.f.=20.6)	.7 d.f.=6.2)	.2 d.f.=8.1)	.2 d.f.=8.7)	1.6	0.8	1.5	0.2
Overall job satisfaction	1.0 d.f.=14.1)	-0.3 (d.f.=6.3)	-1.8 (d.f.=5.6)	-0.6 (d.f.=5.4)	.3 d.f.=22.5)	0.3 d.f.=5.9)	.337 d.f.=5.382	.2 d.f.=9.0)	0.3	0.4	2.1	0.6

Table A12.79: Relationships between teacher characteristics and teacher beliefs, values and overall satisfaction

Characteristics	Teacher gender (female)				Number of establishments in which work (1 school alone)			
	Total sample	Chemistry	Physics	Biology	otal sample	Chemistry	Physics	Biology
Career advancement (reward)	0.8 (d.f.=31.3)	.1** d.f.=14.1)	-2.2 (d.f.=10.4)	-0.5 (d.f.=5.2)	0.1 (d.f.=23.1)	-0.2 (d.f.=12.9)	0.5 (d.f.=9.7)	0.5 (d.f.=3.8)
Management and morale (reward)	1.1 (d.f.=36.8)	3.9** d.f.=13.1)	-1.3 (d.f.=6.5)	-0.4 (d.f.=5.1)	1.6 (d.f.=24.1)	-1.0 11.7)	1.5 (d.f.=11.2)	-0.2 (d.f.=3.4)
Management and morale (value)	0.3 (d.f.=28.36)	2.4* d.f.=13.0)	0.5 (d.f.=10.8)	0.0 (d.f.=4.0)	-0.3 (d.f.=30.0)	-0.4 (d.f.=10.5)	-1.7 (d.f.=9.0)	3.2* (d.f.=10.0)
Personal and professional development (value)	0.0 (d.f.=28.2)	0.4 d.f.=9.2)	0.9 (d.f.=12.9)	-0.2 (d.f.=11.2)	-2.8** (d.f.=37.3)	1.0 (d.f.=4.3)	-0.9 (d.f.=11.8)	4.3** (d.f.=12.9)
Relationship with students (reward)	1.1 (d.f.=28.6)	.1 d.f.=5.8)	-0.3 (d.f.=9.2)	-3.9** (d.f.=14.9)	2.4* (d.f.=28.3)	0.1 (d.f.=10.3)	2.5* (d.f.=8.9)	-0.7 (d.f.=8.3)
Work content (value)	1.2 (d.f.=42.3)	2.9* d.f.=13.0)	-1.8 (d.f.=4.6)	2.2 (d.f.=3.3)	0.5 (d.f.=25.7)	0.7 (d.f.=7.3)	0.8 (d.f.=6.9)	0.8 (d.f.=9.1)
Work load (reward)	1.3 (d.f.=27.0)	4.1** d.f.=13.3)	-0.5 (d.f.=12.1)	-0.3 (d.f.=4.1)	-0.9 (d.f.=34.6)	1.6 (d.f.=4.7)	1.52 (d.f.=6.8)	0.5 (d.f.=5.9)
Work load (value)	0.4 (d.f.=29.1)	2.0 d.f.=8.2)	-0.4 (d.f.=12.8)	-0.0 (d.f.=5.7)	1.0 (d.f.=32.9)	0.2 (d.f.=4.9)	1.2 (d.f.=9.1)	0.3 (d.f.=12.4)
Overall job satisfaction	1.0 (d.f.=28.1)	1.8 d.f.=4.2)	-2.6* (d.f.=5.7)	0.4 (d.f.=3.8)	0.7 (d.f.=25.8)	-0.2 (d.f.=8.2)	2.2 (d.f.=7.9)	0.0 (d.f.=3.6)

APPENDIX 13 DESCRIPTIVE STATISTICS FOR TEACHER SATISFACTION SCALES

The distributions of teacher attitude scales were more problematical than those of the student data, a fact partially explained by the much smaller size of the sample. The greater irregularity in distribution cannot be attributed to this alone, however, as skewness in value distributions particularly have been anticipated by other researchers (e.g., Evans, 1969; Kalleberg, 1977). The latter author states that there is a tendency for individuals to report everything as highly and consistently important and this leads to distributions being negatively skewed in nature. This tendency was observed in the vast majority of the value scales investigated here, the trend being less marked in the administrative responsibility, physical working conditions and work content value scales. Transformations of the data were not completed as procedures of normalisation and log and natural log transformations did not improve the situation notably. Raw scores were thus used in analysis. As most of the reward scales were deemed sufficiently close to normal distributions, parametric analyses were continued but the problems with distribution types should be considered when final results are assessed.

Table A13.01: Means and standard deviations of job rewards and value scales

Teacher attitude scale	Total sample	Chemistry	Physics	Biology
Administrative responsibility	***Reward***			
Mean	0.4	0.4	0.3	0.4
Standard Deviation	0.2	0.3	0.2	0.2
Degrees of freedom	32	10	11	14
	Value			
Mean	0.6	0.7	0.6	0.6
Standard Deviation	0.2	0.3	0.2	0.2
Degrees of freedom	32	10	11	14
Career advancement	***Reward***			
Mean	0.5	0.3	0.5	0.5
Standard Deviation	0.4	0.4	0.4	0.4
Degrees of freedom	36	15	11	14
	Value			
Mean	0.9	0.8	0.9	1.0
Standard Deviation	0.2	0.3	0.2	0.1
Degrees of freedom	40	15	13	16
School and Community relations	***Reward***			
Mean	0.6	0.5	0.5	0.5
Standard Deviation	0.3	0.3	0.3	0.3
Degrees of freedom	42	17	13	16
	Value			
Mean	0.8	0.9	0.9	0.8
Standard Deviation	0.2	0.2	0.2	0.2
Degrees of freedom	43	17	13	17
Management and Morale	***Reward***			
Mean	0.7	0.7	0.7	0.8
Standard Deviation	0.3	0.3	0.3	0.2
Degrees of freedom	39	14	13	15
	Value			
Mean	0.9	0.9	0.9	1.0
Standard Deviation	0.2	0.2	0.2	0.1
Degrees of freedom	38	14	13	14
Material *Rewards*	***Reward***			
Mean	0.6	0.6	0.5	0.5
Standard Deviation	0.2	0.2	0.2	0.2
Degrees of freedom	38	13	13	16
	Value			
Mean	0.9	0.9	0.9	1.0
Standard Deviation	1.0	0.1	0.2	0.0
Degrees of freedom	38	13	14	15
Personal and professional development	***Reward***			
Mean	0.5	0.5	0.4	0.4
Standard Deviation	0.3	0.3	0.3	0.2
Degrees of freedom	33	11	11	14
	Value			
Mean	0.8	0.9	0.9	0.8
Standard Deviation	0.2	0.2	0.2	0.2
Degrees of freedom	32	10	12	13

(Table A13.01 Continued)

Physical working conditions	***Reward***			
Mean	0.6	0.5	0.6	0.6
Standard Deviation	0.2	0.2	0.2	0.3
Degrees of freedom	42	16	13	17
	Value			
Mean	0.9	0.9	0.9	0.9
Standard Deviation	0.1	0.1	0.2	0.1
Degrees of freedom	44	17	14	17
Relationship with colleagues	***Reward***			
Mean	0.7	0.6	0.6	0.7
Standard Deviation	0.3	0.2	0.3	0.3
Degrees of freedom	39	15	12	16
	Value			
Mean	0.8	0.8	0.8	0.9
Standard Deviation	0.2	0.2	0.3	0.2
Degrees of freedom	41	15	14	16
Responsibility for student progress	***Reward***			
Mean	0.7	0.7	0.6	0.7
Standard Deviation	0.2	0.2	0.2	0.2
Degrees of freedom	38	13	14	14
	Value			
Mean	0.9	0.9	0.9	0.8
Standard Deviation	0.2	0.1	0.2	0.2
Degrees of freedom	37	13	14	13
Relationship with students	*Reward*			
Mean	0.7	0.7	0.6	0.8
Standard Deviation	0.2	0.2	0.2	0.2
Degrees of freedom	42	16	13	17
	Value			
Mean	0.9	0.9	1.0	1.0
Standard Deviation	0.1	0.2	0.1	0.1
Degrees of freedom	42	15	13	17
Work content	***Reward***			
Mean	0.9	0.8	0.9	0.9
Standard Deviation	0.2	0.2	0.2	0.1
Degrees of freedom	44	17	14	17
	Value			
Mean	0.9	0.9	1.0	1.0
Standard Deviation	0.1	0.2	0.1	0.1
Degrees of freedom	44	16	15	17
Work load	***Reward***			
Mean	0.6	0.6	0.6	0.6
Standard Deviation	0.2	0.3	0.2	0.2
Degrees of freedom	41	16	12	17
	Value			
Mean	0.8	0.8	0.8	0.8
Standard Deviation	0.2	0.2	0.2	0.1
Degrees of freedom	41	16	13	16
Overall job satisfaction				
Mean	0.7	0.7	0.6	0.7
Standard Deviation	0.2	0.2	0.3	0.2
Degrees of freedom	43	17	14	16

APPENDIX 14 FULL ANALYSIS OF DISTRIBUTION OF SOURCES OF TEACHER SATISFACTION AND DISSATISFACTION BY GROUP CATEGORIES (CHAPTER 8)

Table A14.01: Distribution of satisfaction responses based on teacher gender and age.

	Grouping	*Gender*			*Age*		
Category		*Female (% of 23)*	*Male (% of 11)*	*$^{+}\chi^2$ statistic (d.f.=1)*	*Below 40 (% of 18)*	*above 40 (% of 13)*	*$^{+}\chi^2$ statistic (d.f.=1)*
Personal growth		27	30	0.0	33	23	0.4
Vocation		22	18	0.1	22	15	0.3
Working with students	Miscellaneous	4	18	1.8	6	15	0.8
	Student development	17	27	0.4	17	31	0.9
	Relationship with students	13	0	1.6	17	0	2.4
	Student characteristics	43	0	6.8*	17	46	3.2
	Student achievement	17	18	0.0	22	15	0.2
	Student interest	13	18	0.2	11	23	0.8
	Working with young people	35	0	5.0*	22	15	0.3
	Total	83*	55*	3.0	67	85	1.3
Role as a developer/former/ educator	Human development	26	18	0.3	11	38	3.2
	Student development	17	27	0.4	17	31	0.9
	Development of society	17	18	0.0	17	23	0.2
	Total	43	55	0.4	33	69	3.9
Autonomy		22	9	0.8	11	23	0.8
Speciality subject		13	9	0.1	6	23	2.1
Resources		4	9	0.3	6	8	0.1
External rewards		17	0	2.2	11	15	0.1
Timetable		9	9	0.0	0	15	3.0
Climate		17	0	2.2	11	15	0.1
Infrastructure		9	9	0.0	6	15	0.8
Human relations	General	13	18	0.2	17	15	0.0
	Relationship with colleagues	39	18	1.5	28	46	1.1
	Relationship with students	13	0	1.6	17	0	2.4
	Relationship with parents and guardians	13	0	1.6	6	15	0.8
	Relationship with management	30	9	1.9	22	23	0.0
	Total	61	36	1.8	50	62	0.4
Recognition and respect		13	27	1.0	28	8	2.0
Training		9	0	1.0	11	0	1.5
School characteristics, ethos or educational programme		17	18	0.0	17	15	0.0

*As the cross tabulations, of which the χ^2 statistic is presented here, were 2X2 in nature and cell size was small, acceptance of the significance of cell membership was based on the Fisher's χ^2 calculation rather than the Pearson's χ^2 value where appropriate.

Table A14.02: Distribution of satisfaction responses based on school administration and years of experience.

	Grouping	*School administration*			*Experience*		
Category		*Municipal school (% of 14)*	*Private subsidised school (% of 20)*	*χ^2 statistic (d.f.=1)*	*-11 years (% of 18)*	*12 and more (% of 16)*	*χ^2 statistic (d.f.=1)*
Personal growth		36	20	1.1	39	13	3.0
Vocation		21	20	0.0	22	19	0.1
Working with students	Miscellaneous	14	5	0.9	6	13	0.5
	Student development	29	15	0.9	17	25	0.4
	Relationship with students	7	10	0.1	17	0	2.9
	Student characteristics	29	30	0.0	22	38	1.0
	Student achievement	7	25	1.81	22	13	0.6
	Student interest	14	15	0.0	11	19	0.4
	Working with young people	29	20	0.3	28	19	0.4
	Total	71	75	0.1	78	69	0.4
Being a developer/ former/ Educator	Human development	43	10	4.9*	22	25	0.1
	Student development	29	15	0.9	17	25	0.4
	Development of society	14	20	0.2	11	25	1.1
	Total	64	35	2.8	39	56	1.0
Autonomy		21	15	0.2	17	19	0.0
Speciality subject		14	10	0.2	11	13	0.0
Resources		0	10	1.5	6	6	0.0
External rewards		21	5	2.1	17	6	0.9
Timetable		14	20	0.9	0	19	3.7
Climate		7	15	0.5	17	6	0.9
Infrastructure		21	0	4.7	6	13	0.5
Human relations	General	14	15	0.0	17	13	0.1
	Relationship with colleagues	36	30	0.1	39	25	0.8
	Relationship with students	7	10	0.1	17	0	2.9
	Relationship with parents and guardians	7	10	0.	6	13	0.5
	Relationship with management	21	25	0.1	28	19	0.4
	Total	64	45	1.2	56	50	0.1
Recognition and respect		7	25	1.8	22	13	0.6
Training		14	0	3.0	11	0	1.9
School characteristics, ethos or educational programme		21	15	0.2	22	13	0.6

Table A14.03: Distribution of satisfaction responses based on subject taught.

	Grouping	*Subject taught*			
Category		*Physics (% of 10)*	*Biology (% of 13)*	*Chemistry (% of 11)*	*χ^2 statistic (d.f.=2)*
Personal growth		30	31	18	0.6
Vocation		10	23	27	1.0
Working with students	Miscellaneous	20	8	0	2.6
	Student development	20	23	18	0.1
	Relationship with students	0	15	9	1.7
	Student characteristics	10	38	36	2.
	Student achievement	30	15	9	1.7
	Student interest	10	15	18	0.3
	Working with young people	10	31	27	1.5
	Total	60	77	73	0.8
Being a developer/former/ educator	Human development	0	23	45	6.0*
	Student development	20	23	20	0.1
	Development of society	10	15	18	1.2
	Total	30	54	55	1.7
Autonomy		10	23	18	0.7
Speciality subject		20	15	0	2.3
Resources		0	15	0	3.4
External rewards		0	8	27	4.1
Timetable		10	0	18	2.5
Climate		0	23	9	3.0
Infrastructure		10	15	0	1.8
Human relations	General	0	31	9	4.7
	Relationship with colleagues	20	46	27	2.0
	Relationship with students	0	15	9	1.7
	Relationship with parents and guardians	0	23	0	5.3
	Relationship with management	10	38	18	2.8
	Total	30	77	45	5.4
Recognition and respect		30	8	18	1.9
Training		10	8	0	1.1
School characteristics, ethos or educational programme		30	15	0	1.7

Teachers that taught two or more different subjects were excluded from the analysis.

Table A14.04: Distribution of satisfaction responses based on school location.

	Grouping	*Location of school*		
Category		*La Serena (% of 24)*	*Coquimbo (% of10)*	*χ^2 statistic (d.f.=1)*
Personal growth		25	30	0.1
Vocation		17	30	0.8
Working with students	Miscellaneous	8	10	0.0
	Student development	21	20	0.0
	Relationship with students	8	10	0.0
	Student characteristics	29	30	0.0
	Student achievement	21	10	0.6
	Student interest	8	30	2.
	Working with young people	21	30	0.3
	Total	75	70	0.1
Being a developer/former/ Educator	Human development	25	20	0.1
	Student development	21	20	0.0
	Development of society	13	30	1.5
	Total	50	40	0.3
Autonomy		13	10	0.0
Speciality subject		8	20	0.9
Resources		4	20	0.1
External rewards		8	20	0.9
Timetable		13	0	1.4
Climate		13	10	0.0
Infrastructure		8	10	0.0
Human relations	General	17	10	0.3
	Relationship with colleagues	33	30	0.0
	Relationship with students	8	10	0.0
	Relationship with parents and guardians	4	20	2.2
	Relationship with management	21	30	0.3
	Total	58	40	1.0
Recognition and respect		17	20	0.1
Training		8	0	0.9
School characteristics, ethos or educational programme		21	10	0.5

Table A14.05: Distribution of dissatisfaction responses by teacher gender and age.

	Grouping	Gender			Age		
Category		**Female (% of 19)**	**Male (% of 8)**	χ^2 *statistic (d.f.=1)*	**Age below 40 (% of 14)**	**Age above 40 (% of 11)**	$^{\otimes}\chi^2$ *statistic (d.f.=1)*
Salary		53	63	0.2	50	64	0.5
Training	Initial training	11	0	0.9	7	9	0.0
	In-service training	16	25	0.3	14	27	0.7
Total		26	25	0.0	21	36	0.7
Status		26	11	0.6	29	18	0.
Student characteristics	Student background	11	0	0.9	7	9	0.0
	Student characteristics in school	32	25	0.1	36	27	0.2
Total		37	25	0.4	43	27	0.7
Quantity of Work	Workload	32	25	0.1	29	36	0.2
	Lack of time	16	0	1.4	14	9	0.2
Total		42	25	0.7	43	36	0.1
Pupil Number		21	38	0.8	29	27	0.0
Parental support		11	13	0.0	7	18	0.7
Resources		42	25	0.7	43	36	0.1
Relationships with colleagues		16	0	1.4	7	9	0.0
Computers		11	0	0.9	7	9	0.0
Timetable		11	0	0.9	7	0	0.8
Hours allocated to speciality subject		37	0	4.0	14	36	1.7
Infrastructure		16	25	0.3	21	36	0.7

Table A14.06: Distribution of dissatisfaction responses based on school administration and years of experience.

	Grouping	*School administration*			*Experience*		
Category		*Municipal School (% of 10)*	*Private Subsidised School (% of 17)*	*$^{\otimes}\chi^2$ statistic (d.f.=1)*	*0-11 years (% of 15)*	*12 years and more (% of 12)*	*$^{\otimes}\chi^2$ statistic (d.f.=1)*
Salary		80	41	3.8	53	58	0.1
Training	Initial training	10	6	0.2	13	0	1.7
	In-service training	20	18	0.0	20	17	0.1
Total		30	24	0.1	33	17	1.0
Status		20	24	0.1	27	17	0.4
Student characteristics	Student background	20	0	3.7	7	8	0.0
	Student characteristics in school	30	29	0.0	33	25	0.2
Total		40	29	0.3	40	25	0.7
Quantity of Work	Workload	30	29	0.0	27	33	0.1
	Lack of time	10	12	0.0	13	8	0.2
Total		40	35	0.1	40	33	0.1
Pupil Number		20	29	0.3	27	25	0.0
Parental support		0	18	2.0	7	17	0.7
Resources		60	24	3.6	47	25	1.3
Relationships with colleagues		10	12	0.0	7	17	0.7
Computers		20	0	3.7	7	8	0.0
Timetable		10	6	0.2	0	17	2.7
Hours allocated to speciality subject		40	18	1.6	20	33	0.6
Infrastructure		50	24	2.0	47	42	0.7

Table A14.07: Distribution of dissatisfaction responses based on subject taught.

	Grouping	*Subject*			
		Physics (% of 8)	*Biology (% of 12)*	*Chemistry (% of 6)*	*χ^2 statistic (d.f.=2)*
Category					
Salary		50	75	33	3.1
Training	Initial training	0	17	0	2.5
	In-service training	13	25	17	0.5
	otal	13	42	17	2.5
tatus		13	25	17	0.5
Student characteristics	Student background	0	17	0	2.5
	Student characteristics in school	38	33	17	0.8
Total		38	50	17	1.2
Quantity of Work	Workload	38	33	17	0.8
	Lack of time	13	17	0	1.1
Total		50	50	17	1.7
Pupil Number		25	50	17	0.6
Parental support		0	8	33	4.0
Resources		38	42	17	1.2
Relationships with colleagues		0	8	33	4.0
Computers		0	17	0	2.5
Timetable		0	8	17	1.4
Hours allocated to speciality subject		13	25	50	2.5
Infrastructure		38	25	33	0.4

Teachers that taught two or more different subjects were excluded from the analysis.

Table A14.08: Distribution of dissatisfaction responses based on school location

	Grouping	**Location of school**		
Category		**La Serena (% of 21)**	**Coquimbo (% of 6)**	***χ^2 statistic (d.f.=1)***
Salary		62	33	1.5
Training	Initial training	10	0	0.6
	In-service training	14	33	1.1
Total		24	33	0.2
Status		19	33	0.6
Student characteristics	Student background	5	17	0.3
	Student characteristics in school	24	50	1.5
Total		29	50	1.0
Quantity of Work	Workload	33	17	0.6
	Lack of time	14	0	1.0
Total		43	17	1.4
Pupil Number		24	33	0.2
Parental support		10	17	0.2
Resources		24	83	7.1*
Relationships with colleagues		14	0	1.0
Computers		5	17	1.0
Timetable		10	0	0.6
Hours allocated to speciality subject		24	33	0.2
Infrastructure		24	67	3.9

APPENDIX 15 USE OF MULTILEVEL MODELLING

Multilevel modelling is a form of regression whereby an equation predicting the outcome of a dependent variable drawn from the first level of a hierarchy is created using independent variables from all the levels analysed. The multilevel regression equation incorporates a random error coefficient or residual variation coefficient, that accounts for variation in the dependent variable (y) that is not explained by the independent variable under study (x). This is true of single level regression equations also but in multilevel regression, a random error coefficient is included for each level of the hierarchy under study (Goldstein, 1987).

What makes MLM different from single level regressions is that it is assumed a unique equation can be drawn for each of all the groups (or classes) in the study, each with a unique intercept and slope (Goldstein *et al.*, 1998). In the relationship between Physics achievement and student ability, for example, a separate regression equation can be created for each class/school (Figure A15.01).

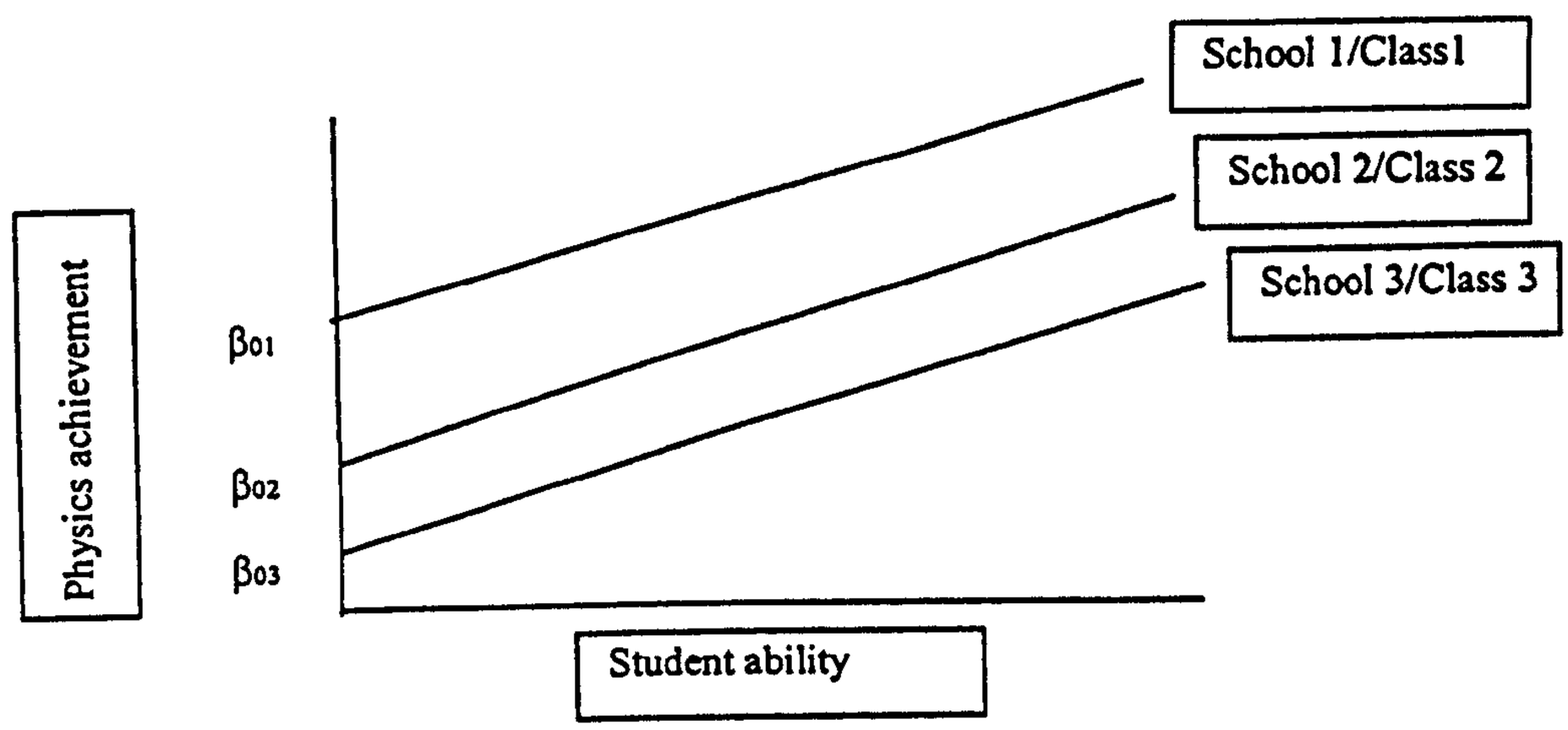


Figure A15.01: Level-2 variation between different classes/school groups (adapted from Goldstein *et al.*, 1998)

Figure A15.01 shows 3 lines representing classes that differ only in their intercepts and represent level 2 variation (Goldstein *et al.*, 1998). The β_{0j} parameter is taken as representing the intercept of the j_{th} school. Explanatory variables at the class (e.g. overall job satisfaction) and student level (e.g. student gender) will cause these intercepts to vary. The intercepts of each class form a distribution of figures with a mean intercept value (β_0) and an associated variance (σ^2_{u0}) of the residuals (u_{0j}).[15]

[15] The symbols used to describe the parameters are those used by Goldstein *et al.*(1998).

Variance as a whole can, therefore, be partitioned between that explained by variance in the residuals (e_{ij}) of the student level (σ^2_{e0}) and that explained by differences between classes (σ^2_{u0}). These figures are reported here as an indication of the hierarchical nature of the data[16].

It is possible to allow for variation that results from allowing classes not only to differ in their intercept (the simpler variance component model) but also in their slope (random coefficient model) (Goldstein *et al.*, 1998). This has not been conducted here as it was found that the models created did not benefit dramatically from this intervention or in some instances failed to reach convergence and this was taken as an indication of poor modelling (Hox, 1995). Such intervention would have provided information on whether the nature of the *relationships* between variables are distinct for each class in addition to whether different classes are achieving in the dependent variable to greater or lesser degrees. It is assumed in this analysis, however, that each class equation has an identical slope and that the relationships between dependent and independent variables are consistent across all classes.

The full regression equation and estimated parameters, created by the technique of MLM, are complex but not all parameters were of direct interest to this study (Hox, 1995). Interactions between variables, for example, were not considered.

[16] The percentage that level 2 variation represents of the total variation was calculated as follows $\rho = \sigma^2_{u0} / (\sigma^2_{u0} + \sigma^2_{e0}) * 100$

In summary, for this investigation a typical model might look as follows:

$$y_{ij} = \beta_0 + \beta_1 x_{1ij} + \beta_2 w_j \ .....\beta_p x_p + (e_{ij} + u_j)$$

- y_{ij} is the dependent variable to be predicted by the regression equation (e.g., student achievement). The y value calculated represents the dependent variable value of the i_{th} student in the j_{th} class/school and is a level 1 variable.
- β_0 is an overall coefficient representing the intercept of the generalised regression line. It is a fixed parameter.
- β_1 is the slope coefficient for the predictor variable x_1 (level 1-student measure). This coefficient is also a fixed parameter in this analysis.
- x_{ij} is the a level 1 predictor variable (e.g., student ability) of the i_{th} student in the j_{th} class/school.
- β_2 is the slope coefficient the predictor variable w, a level 2 variable (e.g., teacher job satisfaction). It is a fixed parameter.
- w_j is a level 2 predictor variable (e.g., teacher job satisfaction).
- e_{ij} is the student level residual. It represents the departure of the i_{th} student's actual *y* score from the score predicted by the equation. This is a random part of the model with an expected mean of zero and a constant variance (σ^2_{e0}).
- u_j is the residual variation between classes/schools that is not accounted for by variation calculated in the equation, i.e., the residual, which will vary randomly between classes. In a simple variance components model the only random variation occurs between the *intercepts* of regression lines drawn for different schools (i.e., the departure of the j_{th} school's intercept from the overall intercept. The u_j quantity is again random in nature with a mean value of 0 and a constant variance (σ^2_{u0}).

The coefficients in the multilevel model are calculated differently from those in normal regression (where the method of ordinary least squares is usually employed). Parameters are calculated in MLM in this study through the technique of iterative generalised least squares and the programme used for analysis was Ml*wi*N.

A measure termed deviance appears also in analysis tables. This represents the difference between maximum likelihood estimates of model parameters. Lower values

of the -2loglikeilhood calculated by MLM indicate models of better fit and significant decreases in this figure (or high deviance measurements) show that the model has been improved upon by the addition of the relevant variables.

The explanatory variables of central interest in each hypothesis were first regressed alone onto the level 1 dependent variable and if the β_p parameter (the variable slope) did not prove significant at this stage, analysis did not proceed. If it was found significant then student, school and teacher background variables, shown to be of possible influence in Chapter 6, were added to the model.

Standard procedure in modelling usually follows methods whereby each variable is added to the model one at a time and its value assessed by reference to the significance of its β_p parameter and its contribution to the deviance statistic. In this research, however, relevant variables were loaded simultaneously. This was done firstly because the order in which variables are added to the equation can often determine the final model and the different combination of variables into an equation are numerous and often confusing. Additionally the contribution of all variables were not of equal interest. In trying to determine the influence of overall job satisfaction upon achievement, for example, the contribution of student ability or gender is of less interest other than they need to be controlled.

In MLM for non-continuous variables, cases containing missing data were removed from all variables entered into the equation. In continuous type data mean values replaced missing values. Furthermore, data had not been standardised when analysed by MLM and, therefore, for effective comparison, significant parameters were converted into standard form by the (SD explanatory variable*βp)/SD dependent variable) conversion (Hox, 1995).

The three science subjects, as was the case in Chapter 6, were analysed separately. Variables that were discontinuous in nature (e.g. father's education, type of school administration) were converted into dummy variables before they were entered into the regression equations. First order linear models only were investigated.

APPENDIX 16 FULL ANALYSIS OF RELATIONSHIPS BETWEEN OVERALL JOB SATISFACTION, TEACHER REWARD AND VALUE SCALES, STUDENT PERCEPTIONS, ATTITUDES AND ACHIEVEMENT (CHAPTER 9)

Hypothesis 1: Overall teacher job satisfaction is associated with student perceptions thereof.

Table A16.01: Relationship between teacher overall job satisfaction and student perceptions of teacher job satisfaction (preliminary analysis)

Dependent variable	Independent explanatory variable	Standard β coefficient CUA	Unstandardised β coefficient MLM
Student perception of Physics teacher job satisfaction	**Teacher overall job satisfaction**	0.5 p=0.05 (d.f.=15)	0.5*
Student perception of Biology teacher job satisfaction		0.4 (d.f.=17)	0.4
Student perception of Chemistry teacher job satisfaction		-0.1 (d.f.=17)	0.1

Table A16.02: Relationship between teacher overall job satisfaction, student perceptions of Physics teacher job satisfaction and background variables (MLM).

Fixed part	Unstandardised βp parameter
Pupil level	
Intercept	0.0
Student age	0.0
Student intelligence	0.0
Class/school level	
Physics teacher overall job satisfaction	0.3
School administration	-0.2
School fee (group 1)	0.1
School fee (group 2)	-0.1
Location	0.0
Number of schools in which the teacher works	0.0
Random part	**Variance components**
Class level variance (σ^2_{e0})	0.0
Student level (σ^2_{u0})	0.3***
Deviance	919.0
	928.6
	9.6 (d.f.=7)

Hypothesis 4: Teacher overall job satisfaction is related to student attitude towards science as a career, the science subject and/or the science teacher.

Table A16.03: Relationships between overall job satisfaction and student attitudes to science (preliminary analysis)

Dependent variable	Independent explanatory variable	Standard β coefficient CUA	Unstandardised β coefficient MLM
Attitude to Physics class	Teacher overall job satisfaction	0.5 (d.f.=15)	0.5*
Attitude to Physics teacher	Teacher overall job satisfaction	0.0 (d.f.=15)	0.1
Attitude to science as a career	Teacher overall job satisfaction	0.0 (d.f.=15)	0.1
Attitude to Biology class	Teacher overall job satisfaction	0.1 (d.f.=17)	0.0
Attitude to Biology teacher	Teacher overall job satisfaction	0.3 (d.f.=17)	0.3
Attitude to science as a career	Teacher overall job satisfaction	-0.2 (d.f.=17)	-0.1
Attitude to Chemistry class	Teacher overall job satisfaction	0.1 (d.f.=17)	0.1
Attitude to Chemistry teacher	Teacher overall job satisfaction	0.2 (d.f.=17)	0.7
Attitude to science as a career	Teacher overall job satisfaction	-0.2 (d.f.=17)	-0.1

Table A16.04: Relationships between overall job satisfaction, student attitudes to Physics class and background variables (MLM)

Fixed part	Unstandardised βp parameter
Pupil level	
Intercept	-0.9
Student age	0.0
Student intelligence	0.0
Class/school level	
Physics teacher overall job satisfaction	0.2
School administration	-0.1
School fee (group 1)	0.1
School fee (group 2)	-0.1
Location	0.0
Number of schools in which the teacher works	0.0
Random part	**Variance components**
Class level variance (σ^2_{e0})	0.0
Student level (σ^2_{u0})	0.7***
Deviance	1271.2
	928.6
	-342.6***(d.f.=8)

Hypothesis 6: Teacher overall job satisfaction is related to student achievement

Table A16.05: Relationships between teacher overall job satisfaction and student achievement (preliminary analysis)

Dependent variable	Independent explanatory variable	Standard β coefficient CUA	Unstandardised β coefficient MLM
Physics independent test score	Teacher overall job satisfaction	0.67** (d.f.=15)	1.49**
Physics term marks	Teacher overall job satisfaction	0.4 (d.f.=15)	1.1
Chemistry independent test score	Teacher overall job satisfaction	-0.05 (d.f.=17)	0.00
Chemistry term marks	Teacher overall job satisfaction	-0.2 (d.f.=17)	0.4
Biology independent test score	Teacher overall job satisfaction	0.13 (d.f.=17)	0.53
Biology term marks	Teacher overall job satisfaction	0.4 (d.f.=17)	0.7

Table A16.06: Relationships between overall job satisfaction, student achievement in independent Physics scores and background variables (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	6.2**	
Student age	-0.2	
Student intelligence	0.0**	0.1**
Class/school level		
Physics teacher overall job satisfaction	1.3**	0.1**
School administration	-0.1	
School fee (group 1)	-0.7	
School fee (group 2)	-0.5	
Location	-0.5	
Number of schools in which the teacher works	0.9**	0.1**
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.0	
Student level (σ^2_{u0})	3.4***	
Deviance	2116.1	
	2143.5	
	27.4*** (d.f.=7)	

Table A16.07: Relationships between overall job satisfaction, student achievement in independent Physics scores and background variables (CUA)

Independent exploratory variable	Standardised regression coefficients	Percentage of explained variance
CUA		
Physics teacher overall job satisfaction	0.6*	
School administration	0.4*	
Student age	n.s.	
Student intelligence	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	
Location	n.s.	
Number of schools in which the teacher works	n.s.	66.6%

Hypothesis 2: Students' beliefs about their teachers' job satisfaction are related to their attitudes towards science as a career, the science subject and /or science teacher

Table A16.08: Relationships between student perceptions of teachers' job satisfaction and student attitudes to science (preliminary analysis)

Dependent variable	Independent explanatory variable	Standard β coefficient CUA	Standard β coefficient SUA	Unstandardised coefficient MLM
PHYSICS	Student perception of Physics teacher job satisfaction			-
Attitude to subject		0.8** (d.f.=15)	0.5*** (d.f.=537)	0.7***
Attitude to teacher		0.6* (d.f.=15)	0.6*** (d.f.=536)	0.8***
Attitude to science as a career		0.2 (d.f.=15)	0.2*** (d.f.=527)	0.2***
BIOLOGY				
Attitude to subject		0.8*** (d.f.=17)	0.5*** (d.f.=543)	0.7***
Attitude to teacher		0.7** (d.f.=17)	0.5*** (d.f.=543)	0.7***
Attitude to science as a career		0.1 (d.f.=17)	0.3*** (d.f.=534)	0.4***
CHEMISTRY				
Attitude to subject		0.7* (d.f.=17)*	0.5*** (d.f.=538)	0.61***
Attitude to teacher		0.7** (d.f.=17)	0.6*** (d.f.=537)	0.8***
Attitude to science as a career		0.2 (d.f.=17)	0.1** (d.f.=530)	0.1**

Table A16.09: Relationships between students' perceptions of Chemistry teachers' satisfaction, student attitude to Chemistry class and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Pupil level		
Intercept	-0.3	
Class/school		
Perception of Chemistry teachers' job satisfaction	0.6***	0.8***
Location	-0.2	
Teacher gender	0.3*	0.1*
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.0	
Student level (σ^2_{u0})	0.5*	
Deviance	1282.6	
	1429.3	
	146.6*** (d.f.=3)	

Table A16.10: Relationships between students' perceptions of **Chemistry** teachers' satisfaction, student attitude to **Chemistry class** and background variables (CUA and SUA).

Independent explanatory variable	**Standardised regression coefficients**	**Percentage explained variance**
CUA		
Perception of Chemistry teachers' job satisfaction	0.7**	
Location	n..s.	
Teacher gender	n..s.	53.4%
SUA	n..s.	
Perception of Chemistry teachers' job satisfaction	0.5***	
Location	-0.1**	
Teacher gender	n..s.	27.0%

Table A16.11: Relationships between students' perceptions of **Chemistry** teachers' satisfaction, student attitude to **Chemistry teacher** and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Perception of Chemistry teachers' job satisfaction		
Pupil level		
Intercept	-0.1	
Student age	0.0	
Student gender	-0.2*	-0.1*
Class/school level		
Perception of Chemistry teachers' job satisfaction	0.8***	0.6*
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.2**	
Student level (σ^2_{u0})	0.4***	
Deviance	1168.2	
	1397.7	
	229.5***(d.f.=3)	

Table A16.12: Relationships between students' perceptions of **Chemistry** teachers' satisfaction, student attitude to **Chemistry teacher** and background variables (CUA and SUA).

Independent explanatory variable	**Standardised regression coefficients**	**Percentage explained variance**
CUA		
Perception of Chemistry teachers' job satisfaction	0.7**	
Student age	n..s.	
Student gender	n..a.	54.8%
SUA		
Perception of Chemistry teachers' job satisfaction	0.6***	
Student gender	0.1*	
Student age	n..s.	40.2%

Table A16.13: Relationships between students' perceptions of **Chemistry** teachers' satisfaction, student attitude to **science as a career** and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Perception of Chemistry teachers' job satisfaction		
Pupil level		
Intercept	0.2**	
Student gender	-0.2*	-0.1*
Class/school level		
Perception of Chemistry teachers' job satisfaction	0.1*	0.1*
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.0	
Student level (σ^2_{u0})	0.6***	
Deviance	1449.0	
	1461.0	
	12.0**(d.f.=2)	

Table A16.14: Relationships between students' perceptions of **Chemistry** teachers' satisfaction, student attitude to **science as a career** and background variables (CUA and SUA).

Independent explanatory variable	**Standardised regression coefficients**	**Percentage explained variance**
CUA		
Perception of Chemistry teachers' job satisfaction	n.s.	
Student gender	n..a..	
SUA		
Perception of Chemistry teachers' job satisfaction	0.10*	
Student gender	0.1	21.0%

Table A16.15: Relationships between students' perceptions of Biology teachers' satisfaction, student attitude to Biology class and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Perception of Biology teachers' job satisfaction		
Pupil level		
Intercept	0.2*	
Student gender	-0.3***	-0.2***
Income per student family member	0.0	
Class/school		
Perception of Biology teachers' job satisfaction	0.7***	0.5***
Location	-0.1	
School administration	0.1	
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.0	
Student level (σ^2_{u0})	0.4*	
Deviance	1125.0	
	1339.4	
	214.4***(d.f.=5)	

Table A16.16: Relationships between students' perceptions of Biology teachers' satisfaction, student attitude to Biology class and background variables (CUA and SUA).

Independent explanatory variable	**Standardised regression coefficients**	**Percentage explained variance**
CUA		
Perception of Biology teachers' job satisfaction	0.8***	
Student gender	n..s.	
Income per student family member	n..a.	
Location	n..s.	
School administration	n..s.	60.3%
SUA		
Perception of Biology teachers' job satisfaction	0.5***	
Student gender	-0.2***	
Income per student family member	n..s.	
Location	n..s.	
School administration	n..s.	34.1%

Table A16.17: Relationships between students' perceptions of **Biology** teachers' satisfaction, student attitude to **Biology teacher** and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Perception of Biology teachers' job satisfaction		
Pupil level		
Intercept	-0.0	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.1	
Income per student family member	0.0	
Class/school level		
Perception of Biology teachers' job satisfaction	0.7***	0.5***
Location	-0.2	
School administration	0.0	
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.1*	
Student level (σ^2_{u0})	0.4***	
Deviance	651.3	
	765.2	
	113.9***(d.f.=6)	

Table A16.18: Relationships between students' perceptions of **Biology** teachers' satisfaction, student attitude to **Biology teacher** and background variables (CUA and SUA).

Independent explanatory variable	**Standardised regression coefficients**	**Percentage explained variance**
CUA		
Perception of Biology teachers' job satisfaction	0.7**	
Mother's education (group 1)	n..s.	
Mother's education (group 2)	n..s.	
Income per student family member	n..s.	
Location	n..s.	
School administration	n..s.	49.9%
SUA		
Perception of Biology teachers' job satisfaction	0.6***	
Mother's education (group 1)	n..s.	
Mother's education (group 2)	n..s.	
Income per student family member	n..s.	
Location	n..s.	
School administration	n..s.	30.5%

Table A16.19: Relationships between students' perceptions of **Biology** teachers' satisfaction, student attitude to **science as a career** and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Pupil level		
Intercept	0.0	
Student gender	-0.2*	-0.1*
Class/school level		
Perception of **Biology** teachers' job satisfaction	0.3***	0.2***
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.0	
Student level (σ^2_{u0})	0.6***	
Deviance	1418.8	
	1461.0	
	42.20***(d.f.=2)	

Table A16.20: Relationships between students' perceptions of **Biology** teachers' satisfaction, student attitude to **science as a career** and background variables (CUA and SUA).

Independent explanatory variable	**Standardised regression coefficients**	**Percentage explained variance**
CUA		
Perception of **Biology** teachers' job satisfaction	n.s.	
Student gender	n..a.	
SUA		
Perception of **Biology** teachers' job satisfaction	0.2***	
Student gender	-0.1*	6.8%

Table A16.21: Relationships between students' perceptions of **Physics** teachers' satisfaction, student attitude to **Physics class** and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Pupil level		
Intercept	-0.3**	
Class/school		
Perception of **Physics** teachers' job satisfaction	0.7***	0.5***
School fee (group 1)	0.0	
School fee (group 2)	-0.1	
Location	0.1	
Teacher gender	-0.1	
Teacher experience	0.0	
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.0	
Student level (σ^2_{u0})	0.5***	
Deviance	1219.6	
	1377.1	
	157.5***(d.f.=6)	

Table A16.22: Relationships between students' perceptions of **Physics** teachers' satisfaction, student attitude to **Physics class** and background variables (CUA and SUA).

Independent explanatory variable	**Standardised regression coefficients**	**Percentage explained variance**
CUA		
Perception of **Physics** teachers' job satisfaction	0.8**	
School fee (group 1)	n..s.	
School fee (group 2)	n..s.	
Location	n..s.	
Teacher gender	n..s.	
Teacher experience	n..s.	58.2%
SUA		
Perception of **Physics** teachers' job satisfaction	0.5***	
School fee (group 1)	n..s.	
School fee (group 2)	n..s.	
Location	n..s.	
Teacher gender	n..s.	
Teacher experience	n..s.	26.2%

Table A16.23: Relationships between students' perceptions of **Physics** teachers' satisfaction, student attitude to **Physics teacher** and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Perception of Physics teachers' job satisfaction		
Pupil level		
Intercept	-0.5	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.1	
Income per student family member	0.0	
Class/school level		
Perception of Physics teachers' job satisfaction	0.7***	0.5***
Location	0.3	
School administration	0.2	
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.2*	
Student level (σ^2_{u0})	0.4***	
Deviance	792.1	
	913.8	
	121.7***(d.f.=6)	

Table A16.24: Relationships between students' perceptions of **Physics** teachers' satisfaction, student attitude to **Physics teacher** and background variables (CUA and SUA).

Independent exploratory variable	**Standardised regression coefficients**	**Percentage explained variance**
CUA		
Perception of Physics teachers' job satisfaction	n.s.	
Mother's education (group 1)	n.s.	
Mother's education (group 2)	n.s.	
Income per student family member	n.s.	
Location	n.s.	
School administration	n.s.	
SUA		
Perception of Physics teachers' job satisfaction	0.5***	
Location	n.s.	
Mother's education (group 1)	n.s.	
Mother's education (group 2)	n.s.	
Income per student family member	n.s.	
Location	0.2**	
School administration	n.s.	34.4%

Table A16.25: Relationships between students' perceptions of **Physics** teachers' satisfaction, student attitude to **science as a career** and background variables (MLM).

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Perception of Physics teachers' job satisfaction		
Pupil level		
Intercept	0.1	
Student gender	-0.2**	-0.1**
Class/school level		
Perception of Physics teachers' job satisfaction	0.3***	0.2***
Random part	**Variance components**	
Class level variance (σ^2_{e0})	0.0	
Student level (σ^2_{u0})	0.6***	
Deviance	1312.6	
	1337.2	
	24.6*** (d.f.=2)	

Table A16.26: Relationships between students' perceptions of **Physics** teachers' satisfaction, student attitude to **science as a career** and background variables (CUA and SUA).

Independent exploratory variable	**Standardised regression coefficients**	**Percentage explained variance**
Perception of Physics teachers' job satisfaction	n.s.	
Student gender	n.a.	0.0%
SUA		
Perception of Physics teachers' job satisfaction	0.2***	
Student gender	-0.1**	4.9%

Hypothesis 5: Student perceptions of teacher satisfaction are significantly related to student achievement

Table A16.27: Relationships between students' perceptions of teachers' satisfaction and student achievement (preliminary analysis)

Dependent variable	Independent explanatory variable	Standard β coefficient CUA	Standard β coefficient SUA	Standard β coefficient MLM
PHYSICS-Independent test score	Student perception of teacher's job satisfaction	0.4 (d.f.=15)	0.1 (d.f.=477)	0.0
PHYSICS- Term marks		0.1 (d.f.=15)	0.1* (d.f.=531)	0.1
BIOLOGY-Independent test score	Student perception of teacher's job satisfaction	0.6* (d.f.=17)	0.2*** (d.f.=482)	0.2
BIOLOGY- Term marks		0.5 (d.f.=17)	0.1 (d.f.=538)	0.0
CHEMISTRY-Independent test score		0.3 (d.f.=17)	0.1* (d.f.=481)	0.1
CHEMISTRY-Term marks	Student perception of teacher's job satisfaction	0.3 (d.f.=17)	0.2*** (d.f.=534)	0.1*

Table A16.28: Relationship between students' perceptions of Biology teacher job satisfaction and achievement in Biology independent test scores (MLM)

CUA	Standardised regression coefficients	Percentage explained variance
Perception of Biology teachers' job satisfaction	n.s.	
Student ability	0.8***	
Student age	n.s.	
Father's education	n.s.	
Mother's education	n.s.	
Income per student family member	n.s.	
School administration	n.s.	
Location	n.s.	
School fee (group 1)	n.s.	
SUA		
Perception of Biology teachers' job satisfaction	0.2**	
School administration	-0.3***	
Student ability	0.2***	
Location	0.2**	
Mother's education (group 2)	0.1*	
Student age	n.s.	
Father's education	n.s.	
Mother's education	n.s.	
Income per student family member	n.s.	
School fee	n.s.	28.2%

Table A16.29: Relationship between students' perceptions of Physics teacher job satisfaction and achievement in Physics term marks (SUA)

	Standardised regression coefficients	**Percentage explained variance**
SUA		
Perception of Physics teachers' job satisfaction	n.s.	
Income per student family member	n.s.	
Student ability	0.3***	
Student gender	-0.2**	
Student age	n.s.	
School fees	n.s.	
Location	n.s.	10.1%

Table A16.30: Relationship between students' perceptions of **Chemistry** teacher's satisfaction and Chemistry term marks (MLM)

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Perception of Chemistry teachers' job satisfaction		
Pupil level		
Intercept	7.14**	
Student gender	0.0	
Perception of Chemistry teachers' job satisfaction	0.1*	0.1*
Student ability	0.04***	0.2***
Student age	-0.2***	-0.2***
Class/school level		
Location	0.4	
School administration	-0.6	
School fee (group 1)	-0.7	
School fee (group 2)	-0.7	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.6***	
Deviance	1411.9	
	1473.3	
	61.4*** (d.f.=8)	

Table A16.31: Relationship between students' perceptions of Chemistry teacher job satisfaction and achievement in Chemistry term marks

	Standardised regression coefficients	**Percentage explained variance**
SUA		
Perception of Chemistry teachers' job satisfaction	0.2***	
Student ability	0.1***	
Student gender	n.s.	
Student age	-0.1**	
School fees	n.s.	
School administration	n.s.	
Location	0.2***	13.7%

Table A16.32: Relationship between students' perceptions of Chemistry teacher job satisfaction and achievement in Chemistry independent test scores

	Standardised regression coefficients	**Percentage explained variance**
SUA		
Perception of Chemistry teachers' job satisfaction	0.1*	
Student ability	0.2***	
Student age	n.s.	
School fees	n.s.	
Father's education	n.s.	
Mother's education	n.s.	
School administration	-0.2**	
Income per student family member	n.s.	15.6%

Hypothesis 3: Student attitude towards science as a career, the science subject and/or science teacher is associated with student achievement

Table A16.33: Significant relationships between student achievement and student attitudes (preliminary analysis)

Dependent variable	*Independent explanatory variable*	*Standard β coefficient CUA*	*Standard β coefficient SUA*	*Standard β coefficient MLM*
Physics independent score	Attitude to subject	0.1 (d.f.=15)	0.1* (d.f.=487)	0.2
	Attitude to teacher	-0.2 (d.f.=15)	0.0 (d.f.=484)	0.0
	Attitude to science as a career	0.1 (d.f.=15)	0.1* (d.f.=478)	0.2*
Physics term marks	Attitude to subject	0.1 (d.f.=15)	0.2*** (d.f.=542)	0.2*
	Attitude to teacher	-0.2 (d.f.=15)	0.1 (d.f.=539)	0.1**
	Attitude to science as a career	-0.3 (d.f.=15)	0.1 (d.f.=531)	0.1*
Biology Independent test score	Attitude to subject	0.3 (d.f.=17)	0.2** (d.f.=484)	0.3*
	Attitude to teacher	0.2 (d.f.=17)	0.0 (d.f.=482)	0.0
	Attitude to science as a career	0.3 (d.f.=17)	0.2*** (d.f.=476)	0.3***
Biology term marks	Attitude to subject	0.6** (d.f.=17)	0.2*** (d.f.=539)	0.2***
	Attitude to teacher	0.3 (d.f.=17)	0.1 (d.f.=538)	0.1
	Attitude to science as a career	0.3 (d.f.=17)	0.1** (d.f.=530)	0.1**
Chemistry independent test score	Attitude to subject	-0.1 (d.f.=17)	0.1 (d.f.=485)	0.3*
	Attitude to teacher	-0.1 (d.f.=17)	0.0 (d.f.=483)	0.1
	Attitude to science as a career	0.2 (d.f.=17)	0.2***.(d.f.=479)	0.4***
Chemistry term marks	Attitude to subject	0.6* (d.f.=17)	0.3*** (d.f.=537)	0.2***
	Attitude to teacher	0.6** (d.f.=17)	0.3*** (d.f.=535)	0.2***
	Attitude to science as a career	0.2 (d.f.=17)	0.2*** (d.f.=527)	0.1*

Table A16.34: Relationship between student attitude to science as a career and Physics independent test scores (MLM)

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Attitude to science as a career		
Pupil level		
Intercept	6.7**	
Student age	-0.2	
Attitude to science as a career	0.1	
Student ability	0.1*	0.1*
Class/school level		
Location	-0.2	
School administration	-0.3	
School fee (group 1)	-0.7	
School fee (group 2)	-0.5	
Number of schools in which teachers work	0.9*	0.2*
Random part	**Variance components**	
Class level variance (σ^{00})	0.1	
Student level (σ^2)	3.4***	
Deviance	2120.3	
	2143.5	
	23.3**(d.f.=8)	

Table A16.35: Relationship between student attitude to science as a career and independent Physics scores (SUA)

	Standardised regression coefficients	**Percentage explained variance**
SUA		
Attitude to science as a career	0.1**	
Student age	-0.1*	
Student ability	0.1**	
Location	n.s.	
School administration	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	
Number of schools in which teachers work	n.s.	5.30%

Table A16.36: Relationship between student attitude to Physics and independent Physics scores (SUA)

	Standardised regression coefficients	**Percentage explained variance**
SUA		
Attitude to Physics	0.1*	
Student age	-0.1**	
Student ability	0.1**	
Location	n.s.	
School administration	n.s.	
School fee	n.s.	6.1%

Table A16.37: Relationship between student attitude to Physics class and Physics term marks (MLM)

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Attitude to Physics		
Pupil level		
Intercept	6.0***	
Student age	-0.2**	-0.1**
Attitude to Physics	0.2***	0.1***
Student ability	0.0***	0.2***
Student gender	-0.1	
Income per student family member	0.0	
Class/school level		
Location	0.1	
School fee (group 1)	0.2	
School fee (group 2)	-0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.3**	
Student level (σ^2)	0.6***	
Deviance	1494.1	
	1549.9	
	55.8***(d.f.=8)	

Table A16.38: Relationship between student attitude to Physics class and Physics term marks (SUA)

	Standardised regression *coefficients*	**Percentage explained variance**
SUA		
Student age	n.s.	
Attitude to **Physics**	n.s.	
Student ability	0.3***	
Student gender	-0.2**	
Income per student family member	n.s.	
Location	n.s.	
School fee	n.s.	9.9%

Table A16.39: Relationship between student attitude to **Physics teacher** and Physics term marks (MLM)

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Pupil level		
Intercept	6.0***	
Student age	-0.2**	-0.1**
Attitude to **Physics** teacher	0.1**	0.1**
Student ability	0.0***	0.2***
Student gender	-0.1	
Income per student family member	-0.0	
Class/school level		
Location	0.1	
School fee (group 1)	0.2	
School fee (group 2)	-0.1	
Random part	**Variance components**	
Class level variance (σ^{00})	0.3**	
Student level (σ^2)	0.7***	
Deviance	1505.1	
	1547.9	
	42.9 ***(d.f.=8)	

Table A16.40: Relationship between student attitude to science as a career and Physics term marks (MLM)

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Pupil level		
Intercept	6.0***	
Student age	-0.2**	0.1**
Attitude to **science as a career**	0.1	
Student ability	0.0***	0.2***
Student gender	-0.1	
Income per student family member	-0.0	
Class/school level		
Location	0.1	
School fee (group 1)	0.2	
School fee (group 2)	-0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.3**	
Student level (σ^2)	0.7***	
Deviance	1510.2	
	1547.9	
	37.8***(d.f.=8)	

Table A16.41: Relationship between student attitude to **Biology class** and Biology independent score (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	0.5	
Student age	0.0	
Attitude to **Biology class**	0.3**	0.1**
Student ability	0.1***	0.2***
Father's education (group 1)	0.1	
Father's education (group 2)	0.2	
Mother's education (group 1)	-0.7**	-0.1**
Mother's education (group 2)	-0.3	
Income per student family member	0.0	
Class/school level		
School administration	0.0	
Location	0.5	
School fee (group 1)	1.7***	0.3***
School fee (group 2)	1.9***	0.4***
Random part	**Variance components**	
Class level variance (σ^{00})	0.4*	
Student level (σ^2)	3.4***	
Deviance	1628.1	
	1678.9	
	50.8***(d.f.=12)	

Table A16.42: Relationship between student attitude to Biology class and Biology independent test scores (SUA)

	Standardised regression coefficients	**Percentage explained variance**
SUA		
Student age	n.s.	
Attitude to **Biology class**	0.2**	
Student ability	0.2***	
Father's education (group 1)	n.s.	
Father's education (group 2)	n.s.	
Mother's education (group 1)	n.s.	
Mother's education (group 2)	n.s.	
Income per student family member	n.s.	
School administration	-0.3***	
Location	0.2**	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	

Table A16.43: Relationship between student attitude to **science as a career** and Biology independent score (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	0.9	
Student age	0.0	
Attitude to **science as a career**	0.4**	0.1**
Student ability	0.1***	0.2***
Father's education (group 1)	0.1	
Father's education (group 2)	0.2	
Mother's education (group 1)	-0.7**	-0.2**
Mother's education (group 2)	-0.3	
Income per student family member	0.0	
Class/school level		
School administration	0.0	
Location	0.5	
School fee (group 1)	1.8***	0.3***
School fee (group 2)	1.9***	0.4***
Random part	**Variance components**	
Class level variance (σ^{00})	0.4*	
Student level (σ^2)	3.4***	
Deviance	1625.8	
	1678.9	
	53.1***(d.f.=12)	

Table A16.44: Relationship between student attitude to science as a career and Biology independent test scores (SUA)

	Standardised regression coefficients	Percentage explained variance
SUA		
Student age	n.s.	
Attitude to science as a career	0.2***	
Student ability	0.2***	
Father's education (group 1)	n.s.	
Father's education (group 2)	n.s.	
Mother's education (group 1)	n.s.	
Mother's education (group 2)	0.1*	
Income per student family member	n.s.	
School administration	-0.3***	
Location	0.2**	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	30.4%

Table A16.45: Relationship between student attitude to **Biology class** and Biology term marks (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	6.3***	
Student age	-0.2**	-0.1**
Attitude to **Biology class**	0.2***	0.2***
Student gender	-0.1	
Student ability	0.0***	0.2***
Class/school level		
Location	0.1	
School fee (group 1)	-0.2	
School fee (group 2)	-0.5*	-0.3*
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.7***	
Deviance	1493.7	
	1538.8	
	45.1***(d.f.=7)	

Table A16.46: Relationship between student attitude to Biology and Biology term marks (CUA and SUA)

CUA	**Standardised regression coefficients**	Percentage explained variance
Student age	n.s.	
Attitude to Biology class	0.9***	
Student gender	n.a.	
Student ability	n.s.	
Location	0.5*	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	54.7%
SUA		
Student age	n.s.	
Attitude to Biology class	0.2***	
Student gender	-0.2***	
Student ability	0.2***	
Location	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	-0.2***	13.3%

Table A16.47: Relationship between student attitude to **science as a career** and Biology term marks (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	6.6***	
Student age	-0.2**	-0.1**
Attitude to **science as a career**	0.1*	0.1*
Student gender	-0.1	
Student ability	0.0***	0.2***
Class/school level		
Location	0.1	
School fee (group 1)	-0.2	
School fee (group 2)	-0.5	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.7***	
Deviance	1503.2	
	1538.8	
	35.7***(d.f.=7)	

Table A16.48: Relationship between student attitude to science as a career and Biology term marks (SUA)

	Standardised regression coefficients	Percentage explained variance
SUA		
Student age	n.s.	
Attitude to **science as a career**	0.1*	
Student gender	-0.2***	
Student ability	0.2***	
Location	0.1*	
School fee (group 1)	n.s.	
School fee (group 2)	-0.2***	10.8%

Table A16.49: Relationship between student attitude to Chemistry class and Chemistry independent score (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	2.1*	
Student age	0.1	
Father's education (group 1)	0.4	
Father's education (group 2)	-0.1	
Mother's education (group 1)	-0.0	
Mother's education (group 2)	0.2	
Attitude to **Chemistry**	0.2	
Income per student family member	0.0	
Student ability	0.1**	0.2**
Class/school level		
School administration	-1.0	
School fee (group 1)	0.9	
School fee (group 2)	-0.1	
Number of schools in which teacher works	1.1**	0.2**
Random part	**Variance components**	
Class level variance (σ^{00})	0.1	
Student level (σ^2)	3.8***	
Deviance	1514.1	
	1552.8	
	38.7***(d.f.=12)	

Table A16.50: Relationship between student attitude to science as a career and Chemistry independent score (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	2.1	
Student age	0.1	
Father's education (group 1)	0.3	
Father's education (group 2)	0.1	
Mother's education (group 1)	0.0	
Mother's education (group 2)	0.2	
Attitude to **science as a career**	0.3*	0.1*
Income per student family member	0.0	
Student ability	0.1**	0.2**
Class/school level		
School administration	-1.1	
School fee (group 1)	0.9	
School fee (group 2)	-0.1	
Number of schools in which teacher works	1.1***	0.2***
Random part	**Variance components**	
Class level variance (σ^{00})	0.1	
Student level (σ^2)	3.8***	
Deviance	1511.6	
	1552.8	
	41.3***(d.f.=12)	

Table A16.51: Relationship between student attitude to science as a career and Chemistry independent score (SUA)

	Standardised regression coefficients	Percentage explained variance
SUA		
Student age	n.s.	
Father's education (group 1)	n.s.	
Father's education (group 2)	n.s.	
Mother's education (group 1)	n.s.	
Mother's education (group 2)	n.s.	
Attitude to **science as a career**	0.3*	
Income per student family member	n.s.	
Student ability	0.9***	
School administration	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	
Number of schools in which teacher works	n.s.	82.4%

Table A16.52: Relationship between student attitude to Chemistry and Chemistry term marks (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	7.2***	
Student age	-0.2***	-0.2***
Attitude to Chemistry class	0.2***	0.2***
Student gender	0.0	
Student ability	0.03***	0.2***
Class/school level		
School administration	-0.6	
School fee (group 1)	-0.7	
School fee (group 2)	-0.7	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.6***	
Deviance	1395.5	
	1473.3	
	77.9***(d.f.=7)	

Table A16.53: Relationship between student attitude to Chemistry class and Chemistry term marks (CUA and SUA)

CUA	**Standardised regression coefficients**	**Percentage explained variance**
Student age	n.s.	
Attitude to Chemistry class	0.7**	
Student gender	n.s.	
Student ability	n.s.	
School administration	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	
Location	0.4*	53.6%
SUA		
Student age	-0.1**	
Attitude to Chemistry class	0.3***	
Student gender	n.s.	
Student ability	0.2***	
School administration	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	
Location	0.2***	20.2%

Table A16.54: Relationship between student attitude to Chemistry teacher and Chemistry term marks (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	7.1***	
Student age	-0.2***	-0.2***
Attitude to **Chemistry teacher**	0.2***	0.2***
Student gender	0.0	
Student ability	0.0***	0.2***
Class/school level		
School administration	-0.6	
School fee (group 1)	-0.6	
School fee (group 2)	-0.7	
Location of school	0.4	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.6***	
Deviance	1396.1	
	1473.3	
	77.2***(d.f.=8)	

Table A16.55: Relationship between student attitude to Chemistry teacher and Chemistry term marks (CUA and SUA)

CUA	**Standardised regression coefficients**	**Percentage explained variance**
Student age	**n.s.**	
Attitude to **Chemistry teacher**	**0.6****	
Student gender	**n.s.**	
Student ability	**n.s.**	
School administration	**n.s.**	
School fee (group 1)	**n.s.**	
School fee (group 2)	**n.s.**	
Location of school	**n.s.**	37.3%
SUA		
Student age	-0.1**	
Attitude to **Chemistry teacher**	0.3***	
Student gender	n.s.	
Student ability	0.2***	
School administration	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	
Location of school	0.2***	22.1%

Table A16.56: Relationship between student attitude to science as a career and Chemistry term marks (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Pupil level		
Intercept	7.2***	
Student age	-0.2***	-0.2***
Attitude to **science as a career**	0.1*	0.1*
Student gender	-0.0	
Student ability	0.0***	0.2***
Class/school level		
School administration	-0.7	
Location	0.4	
School fee (group 1)	-0.7	
School fee (group 2)	-0.7	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.6***	
Deviance	1410.4	
	1473.3	
	62.9***(d.f.=8)	

Table A16.57: Relationship between student attitude to science as a career and Chemistry term marks (SUA)

	Standardised regression coefficients	Percentage explained variance
SUA		
Student age	-0.2***	
Attitude to **attitude to science as a career**	0.1*	
Student gender	n.s.	
Student ability	0.2***	
Class/school level		
School administration	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	
Location	0.2***	11.0%

Hypothesis 7: Teacher reports of job characteristic rewards and/or values are associated with student perceptions of teacher job satisfaction

Table A16.58: The relationship between job characteristics' reward and value variables and student perceptions of teacher job satisfaction (preliminary analysis)

Dependent variable	*Independent explanatory variable*	CHEMISTRY		BIOLOGY		PHYSICS	
		CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)
Student perception of teacher job satisfaction	Administrative responsibility *(reward*	-0.2	-0.1	0.4	0.4	-0.1	0.0
	(value)	0.0	0.1	0.4	0.4	0.1	0.1
	Career advancement *(reward)*	0.2	0.1	0.7***	0.4**	0.3	0.2
	(value)	0.7**	0.6*	-0.2	-0.6	-0.2	-0.3
	Community school relations *(reward)*	-0.4	-0.1	0.4	0.4	0.1	0.1
	(value)	0.1	0.1	0.1	0.1	-0.4	-0.4
	Management and morale *(reward)*	-0.2	-0.1	0.3	0.3	0.2	0.1
	(value)	-0.3	-0.6	0.2	0.4	-0.1	-0.1
	Material rewards *(reward)*	0.2	0.6	0.6**	0.7**	0.4	0.4
	(value)	0.6*	0.7	-0.5	-1.5**	-0.2	-0.2
	ersonal and rofessional evelopment *(reward)*	-0.3	-0.3	0.5	0.4	0.3	0.2
	(value)	-0.1	-0.6	0.4	0.7*	0.1	0.1
	Physical working conditions *(reward)*	-0.0	0.2	0.3	0.3	0.4	0.5
	(value)	0.1	0.1	0.1	0.2	-0.1	-0.1
	Relationships with colleagues *(reward)*	-0.1	-0.2	0.1	0.0	0.3	0.2
	(value)	0.3	0.1	-0.1	-0.3	-0.1	0.0
	Responsibility for student progress *(reward)*	-0.4	-0.3	0.3	0.2	0.2	0.2
	(value)	-0.2	0.1	0.1	0.1	0.4	0.6
	Student characteristics *(reward)*	-0.3	-0.4	0.0	0.1	0.4	0.4
	(value)	-0.2	-0.6	0.1	0.4	-0.2	-0.6
	Work content *(reward)*	-0.3	-0.9*	-0.4	-0.7	-0.1	-0.1
	(value)	-0.4	-1.0**	-0.5*	-1.5**	0.1	0.6
	Work load *(reward)*	-0.2	-0.3	0.3	0.3	0.3	0.3
	(value)	0.1	-0.2	0.1	-0.2	0.0	0.0

Table A16.59: Relationship between Chemistry teacher reward/value scales and student perceptions of Chemistry teacher job satisfaction (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Career advancement (value)		
Pupil level		
Intercept	0.5	
Student age	0.0	
Student gender	-0.1*	0.1*
Student ability	0.0	
Class/school level		
Career advancement (value)	0.6	
School administration	-0.3	
School fee (group 1)	-0.2	
School fee (group 2)	-0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.3**	
Deviance	1013.5	
	1025.9	
	12.4(d.f.=7)	
Work content (reward)		
Pupil level		
Intercept	1.6*	
Student age	0.0	
Student gender	-0.1*	-0.1*
Student ability	0.0	
Class/school level		
Work content (reward)	-0.8*	-0.2*
School administration	-0.4	
School fee (group 1)	-0.4	
School fee (group 2)	-0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.3***	
Deviance	1012.6	
	1025.1	
	12.5 (d.f.=7)	
Work content (value)		
Pupil level		
Intercept	1.9**	
Student age	-0.0	
Student gender	-0.1*	-0.1*
Student ability	0.0	
Class/school level		
Work content (value)	-1.0**	-0.3**
School administration	-0.5*	-0.4*
School fee (group 1)	-0.3	
School fee (group 2)	-0.4	
Random part		
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.3**	
Deviance	1009.2	
	1025.1	
	15.9*(d.f.=7)	

Table A16.60: Relationship between Chemistry teacher reward/value scales and student perceptions of Chemistry teacher job satisfaction (CUA)

	Standardised regression coefficients	Percentage explained variance
CUA		
Career advancement (value)	0.7**	
Student age	n.s.	
Student ability	n.s.	
School administration	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	46.1%
Material rewards (value)	0.6**	
Student age	n.s.	
Student ability	n.s.	
School administration	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	33.50%

Table A16.61: Relationship between Biology teacher reward/value scales and student perceptions of Biology teacher job satisfaction (MLM)

Fixed part	UnstSandardised regression coefficients	Standardised values of significant coefficients
BIOLOGY		
Material rewards (reward)		
Pupil level		
Intercept	1.1	
Student age	-0.0	
Income per student family member	0.0	
Student ability	0.0	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.0	
Class/school level		
Material rewards (reward)	0.6**	0.2**
School administration	-0.3	
Location	-0.2**	-0.1**
School fee (group 1)	-0.2	
School fee (group 2)	-0.1	
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.2***	
Deviance	670.2	
	697.1	
	26.9**(d.f.=10)	
Material rewards (value)		
Pupil level		
Intercept	3.2**	
Student age	0.0	
Income per student family member	0.0	
Student ability	0.0	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.0	
Class/school level		
Material rewards (value)	-1.3*	-0.2*
School administration	-0.6***	-0.5***
Location	-0.1	
School fee (group 1)	-0.4*	0.3*
School fee (group 2)	-0.5*	-0.4*
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.3***	
Deviance	673.5	
	697.1	
	23.4**(d.f.=10)	
Career advancement (reward)		
Pupil level		
Intercept	1.7*	
Student age	0.0	
Income per student family member	0.0	
Student ability	0.0	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.1	

Table 16.61 (Continued)

Class/school level		
Career advancement (reward)	0.3**	0.2**
School administration	-0.4*	-0.3*
Location	-0.2**	-0.2**
School fee (group 1)	-0.2	
School fee (group 2)	-0.2	
Random part		
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.3***	
Deviance	671.3	
	697.1	
	25.8**(d.f.=10)	
Personal and professional development (value)		
Pupil level		
Intercept	1.6	
Student age	-0.0	
Income per student family member	0.0	
Student ability	0.0	
Mother's education (group 1)	0.09	
Mother's education (group 2)	0.3	
Class/school level		
Personal and professional development (value)	0.3	
School administration	-0.5**	-0.4**
Location	-0.1	
School fee (group 1)	-0.4	
School fee (group 2)	-0.3	
Random part		
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.3***	
Deviance	677.1	
	697.1	
	20.0**(d.f.=10)	
Work content (value)		
Pupil level		
Intercept	3.2**	
Student age	0.0	
Income per student family member	0.0	
Student ability	0.0	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.0	
Class/school level		
Work content (value)	-1.4	
School administration	-0.7	
Location	0.1	
School fee (group 1)	-0.6*	-0.5*
School fee (group 2)	-0.5**	-0.4**
Random part		
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.3***	
Deviance	675.1	
	697.1	
	22.0* (d.f.=10)	

Table A16.62: Relationship between Biology teacher reward/value scales and student perceptions of Biology teacher job satisfaction (CUA)

CUA	Standardised regression coefficients	Percentage explained variance
Career advancement (reward)		
Career advancement (reward)	0.5**	
Student age	n.s.	
Income per student family member	n.s.	
Student ability	n.s.	
School administration	-0.5**	
Location	-0.3*	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	83.0%
Material rewards (reward)		
Material rewards (reward)	0.5*	
Student age	n.s.	
Income per student family member	n.s.	
Student ability	n.s.	
School administration	-0.5*	
Location	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	68.7%
Work content (value)		
Work content (value)	n.s.	
Student age	n.s.	
Income per student family member	n.s.	
Student ability	n.s.	
School administration	-0.7**	
Location	n.s.	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	47.7%

Hypothesis 8: Teacher reports of job characteristic rewards and/or values are associated with student attitude towards science as a career, the science subject and/or science teacher

Table A16.63: Significant relationships between job characteristic reward and value variables and student attitude to subject (preliminary analysis)

Dependent variable	*Independent explanatory variable*	CHEMISTRY		BIOLOGY		PHYSICS	
		CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)
Attitude to science subject	Administrative responsibility *(reward)*	0.2	0.2	0.1	0.0	0.1	0.0
	(value)	0.1	0.1	0.2	0.0	-0.1	0.0
	Career advancement *(reward)*	0.2	0.1	0.4	0.2	0.2	0.2
	(value)	0.3	0.4	0.0	-0.1	-0.3	-0.4
	Community school relations *(reward)*	-0.4	-0.3	0.1	0.1	0.0	0.1
	(value)	0.2	0.1	0.0	-0.1	-0.4	-0.4
	Management and morale *(reward)*	-0.4	-0.5*	0.0	-0.2	0.1	0.1
	(value)	-0.4	-0.8*	-0.1	-0.5	-0.2	-0.2
	Material rewards *(reward)*	0.0	0.1	0.5	0.5	0.3	0.3
	(value)	0.2	0.3	-0.2	-0.4	-0.3	-0.3
	Personal and professional development *(reward)*	-0.1	-0.2	0.1	0.0	0.2	0.2
	(value)	-0.1	-0.5	0.5	0.7	0.1	0.1
	Physical working conditions *(reward)*	-0.1	0.0	0.0	0.1	0.2	0.3
	(value)	0.1	0.0	0.3	0.7	-0.3	-0.4
	Relationships with colleagues *(reward)*	-0.1	-0.5	0.0	-0.2	0.2	0.1
	(value)	0.1	0.0	-0.1	-0.2	-0.2	-0.1
	Responsibility for student progress *(reward)*	-0.1	-0.2	0.1	0.0	0.1	0.1
	(value)	0.0	-0.1	0.1	0.0	0.2	0.3
	Student characteristics *(reward)*	-0.3	-0.6	-0.3	-0.3	0.4	0.4*
	(value)	-0.4	-0.9*	-0.1	-0.5	-0.2	-0.9
	Work content *(reward)*	-0.4	-1.0*	-0.4	-0.7	0.5	0.6
	(value)	-0.6*	-1.3***	-0.4	-1.1	0.6*	0.7
	Work load *(reward)*	-0.3	-0.5	0.2	0.1	0.4	0.3
	(value)	-0.2	-0.5	-0.2	-0.5	-0.1	-0.2

Table A16.64: Relationship between Chemistry teacher reward/value scales and student attitude to Chemistry (MLM)

Fixed part	**Unstandardised regression coefficients**	**Standardised values of significant coefficients**
Management and morale (reward)		
Pupil level		
Intercept	0.4	
Class/school level		
Management and morale (reward)	-0.3	
Location	-0.1	
Teacher gender	0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.5***	
Deviance	1423.8	
	1429.3	
	5.4(d.f.=3)	
Management and morale (value)		
Pupil level		
Intercept	1.0*	
Class/school level		
Management and morale (value)	-0.8*	-0.2*
Location	-0.2	
Teacher gender	0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.5***	
Deviance	1420.7	
	1429.3	
	8.6*(d.f.=3)	
Student characteristics (value)		
Pupil level		
Intercept	1.1*	
Class/school level		
Student characteristics (value)	-0.9*	-0.2*
Location	-0.2	
Teacher gender	0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.5***	
Deviance	1420.6	
	1429.3	
	8.6*(d.f.=3)	
Work content (reward)		
Pupil level		
Intercept	1.4***	
Class/school level		
Work content (reward)	-1.2	
Location	-0.4**	-0.2**
Teacher gender	0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.0*	
Student level (σ^2)	0.5***	
Deviance	1416.4	
	1429.3	
	12.8**(d.f.=3)	

TABLE A16.64 (CONTINUED)

Work content (value)		
Pupil level		
Intercept	1.4***	
Class/school level		
Work content (value)	-1.2	
Location	-0.2	
Teacher gender	0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.5***	
Deviance	1416.0	
	1429.3	
	13.3**(d.f.=3)	

Table A16.65: Relationship between Chemistry teacher reward/value scales and student attitude to Chemistry (CUA)

CUA	Standardised regression coefficients	Percentage explained variance
Work content (value)		
Work content (value)	-0.6*	
Location	n.s.	
Teacher gender	n.s.	30.2%

Table A16.66 Relationship between Physics teacher reward/value scales and student attitude to Physics (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Student characteristics (reward)		
Pupil level		
Intercept	0.1	
Class/school level		
Student characteristics (reward)	0.2	
School fee (group 1)	-0.1	
School fee (group 2)	-0.1	
Location	0.1	
Teacher gender	-0.1	
Experience	0.0*	0.1*
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.7***	
Deviance	1337.1	
	1361.4	
	24.4***(d.f.=6)	

Table A16.67: Relationship between Physics teacher reward/value scales and student attitude to Physics (CUA)

	Standardised regression coefficients	Percentage explained variance
CUA		
Work content (value)		
Work content (value)	0.6*	
School fee (group 1)	n.s.	
School fee (group 2)	n.s.	
Location	n.s.	
Teacher gender	n.s.	
Experience	n.s.	37.80%

Table A16.68: Relationships between job characteristic reward and value variables and student attitude to science teacher (preliminary analysis)

Dependent variable	*Independent explanatory variable*	CHEMISTRY		BIOLOGY		PHYSICS	
		CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)
Attitude to science teacher	dministrative esponsibility *(reward)*	0.3	0.5	0.4	0.6	0.3	0.3
	(value)	0.2	0.6	0.5	0.7	0.1	0.5
	Career advancement *(reward)*	0.3	0.4	0.5	0.5*	-0.3	-0.1
	(value)	0.5	1.0	0.2	1.0	-0.3	0.5
	Community school relations *(reward)*	-0.1	0.0	0.1	0.4	-0.2	-0.6
	(value)	0.2	0.5	0.1	0.2	-0.6*	0.1
	Management and morale *(reward)*	-0.2	-0.3	0.0	-0.1	-0.3	-0.3
	(value)	-0.2	-0.8	0.0	-0.2	-0.2	0.0
	Material rewards *(reward)*	0.3	0.0	0.6**	1.2***	-0.2	-0.1
	(value)	0.2	0.7	0.0	-0.2	-0.3	0.0
	Personal and professional development *(reward)*	-0.2	-0.5	0.4	0.5	0.3	0.3
	(value)	-0.2	-0.8	0.7**	1.7***	0.1	-1.0
	Physical working conditions *(reward)*	0.1	0.6	0.1	0.2	-0.2	-0.6
	(value)	0.2	0.7	0.4	1.5	-0.4	-0.2
	Relationships with colleagues *(reward)*	0.1	0.0	0.1	0.0	-0.1	-0.2
	(value)	0.1	0.1	0.2	0.2	-0.4	-0.3
	Responsibility for student progress *(reward)*	0.0	-0.1	0.3	0.4	0.3	-0.5
	(value)	0.08	0.52	0.24	0.42	0.19	-1.97*
	Student characteristics *(reward)*	-0.1	-0.4	-0.1	0.0	0.3	-0.6
	(value)	-0.4	-1.6*	0.2	1.5	-0.4	1.3
	Work content *(reward)*	-0.5*	-1.8**	-0.4	-1.1**	0.2	0.4
	(value)	-0.6**	-2.2**	-0.4	-1.8	0.2	-0.2
	Work load *(reward)*	-0.3	-0.7	0.2	0.4	0.6*	-0.4
	(value)	-0.1	-0.5	-0.1	-0.5	-0.2	0.1

Table A16.69: Relationship between Chemistry teacher reward/value scales and student attitude to teacher (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Student characteristics (value)		
Pupil level		
Intercept	1.9	
Student age	0.0	
Student gender	-0.2**	-0.1**
Class/school level		
Student characteristics (value)	-1.4	
Random part	**Variance components**	
Class level variance (σ^{00})	0.3**	
Student level (σ^2)	0.5***	
Deviance	1383.3	
	1397.7	
	14.4**(d.f.=3)	
Work content (reward)		
Pupil level		
Intercept	1.9*	
Student age	-0.0	
Student gender	-0.2***	-0.1***
Class/school level		
Work content (reward)	-1.7*	-0.3*
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.5***	
Deviance	1381.3	
	1397.7	
	16.4***(d.f.=3)	
Work content (value)		
Pupil level		
Intercept	2.4**	
Student age	0.0	
Student gender	-0.2**	-0.1**
Class/school level		
Work content (value)	-2.1**	-0.4**
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.5***	
Deviance	1378.4	
	1397.7	
	19.3***(d.f.=3)	

Table A16.70: Relationship between Chemistry teacher reward/value scales and student attitude to teacher (CUA)

CUA	Standardised regression coefficients	Percentage explained variance
Work content (reward)		
Student age	n.s.	
Work content (reward)	-0.5*	27.1%
Work content (value)		
Student age	n.s.	
Work content (value)	-0.6**	38.3%

Table A16.71: Relationship between Biology teacher reward/value scales and student attitude to teacher (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Career advancement (reward)		
Pupil level		
Intercept	0.6**	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.2	
Income per student family member	0.0	
Class/school level		
Career advancement (reward)	0.5	
Location	-0.4	
School administration	-0.1	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.6***	
Deviance	961.3	
	970.9	
	9.6(d.f.=6)	
Material rewards (reward)		
Pupil level		
Intercept	-0.1	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.2	
Income per student family member	0.0	
Class/school level		
Material rewards (reward)	1.4***	0.3***
Location	-0.3	
School administration	-0.1	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.6***	
Deviance	954.9	
	970.9	
	16.1*(d.f.=6)	

Table A16.71 (Continued)

Work content (reward)		
Pupil level		
Intercept	1.4	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.2	
Income per student family member	0.0	
Class/school level		
Work content (reward)	-0.7	
Location	-0.3	
School administration	-0.	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.6***	
Deviance	963.1	
	970.9	
	7.8(d.f.=6)	
Personal and professional development (value)		
Pupil level		
Intercept	-0.5	
Mother's education (group 1)	0.1	
Mother's education (group 2)	0.2	
Income per student family member	0.00	
Class/school level		
Personal and professional development (value)	1.5**	0.3**
Location	-0.1	
School administration	-0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1***	
Student level (σ^2)	0.6***	
Deviance	958.2	
	970.9	
	12.7* (d.f.=6)	

Table A16.72: Relationship between Biology teacher reward/value scales and student attitude to teacher (CUA)

CUA	Standardised regression coefficients	Percentage explained variance
Material rewards (reward)		
Mother's education (group 1)	n.s.	
Mother's education (group 2)	n.s.	
Income per student family member	n.s.	
Material rewards (reward)	0.7**	
Location	n.s.	
School administration	n.s.	54.6%
Personal and professional development (value)		
Mother's education (group 1)	n.s.	
Mother's education (group 2)	n.s.	
Income per student family member	n.s.	
Personal and professional development (value)	0.7**	
Location	n.s.	
School administration	n.s.	43.2%

Table A16.73: Relationship between Physics teacher reward/value scales and student attitude to teacher (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Responsibility for student progress (value)		
Pupil level		
Intercept	2.1*	
Class/school level		
Responsibility for student progress (value)	-2.0*	-0.3*
Location	-0.0	
School administration	0.1	
School fees (group 1)	0.0	
School fees (group 2)	0.1	
Total number of hours teacher works	0.0	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.5***	
Deviance	1260.3	
	1264.9	
	4.6(d.f.=6)	

Table A16.74: Relationship between Physics teacher reward/value scales and student attitude to teacher (CUA)

CUA	Standardised regression coefficients	Percentage explained variance
Community-school relations (value)		
Community-school relations (value)	-0.6**	
Location	n.s.	
School administration	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	
Total number of hours teacher works	n.s.	67.4%
Work load (reward)		
Work load (reward)	0.7 *	
Location	n.s.	
School administration	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	
Total number of hours teacher works	n.s.	42.2%

Table A16.75: Significant relationships between job characteristic reward and value variables and student attitude to science as a career (preliminary analysis)

Dependent variable	*ndependent xplanatory variable*	CHEMISTRY		BIOLOGY		HYSICS	
		CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)
Attitude to science as a career	Administrative responsibility *(reward)*	-0.3	-0.2	0.0	-0.0	-0.4	0.2
	(value)	-0.5	-0.3	0.0	-0.0	-0.3	-0.1
	Career advancement *(reward)*	-0.3	-0.1	0.0	0.0	-0.2	0.
	(value)	-0.2	-0.2	-0.1	-0.4	0.1	0.0
	Community school relations *(reward)*	-0.4	-0.2	-0.3	-0.1	-0.	0.1
	(value)	-0.2	-0.2	-0.1	-0.2	0.1	0.1
	Management and morale *(reward)*	-0.3	-0.1	0.1	0.2	0.2	0.
	(value)	-0.4	-0.3*	0.1	0.1	0.2	0.1
	Material rewards *(reward)*	-0.3	-0.2	0.1	-0.1	0.3	-0.2
	(value)	-0.4	-0.6*	0.1	0.2	0.1	0.0
	Personal and professional development *(reward)*	-0.2	-0.0	-0.2	-0.1	-0.2	-0.1
	(value)	-0.5*	-0.5**	0.1	0.0	-.0	0.0
	Physical working conditions *(reward)*	0.1	0.2	0.0	0.0	-0.2	-0.1
	(value)	-0.2	-0.3	0.5	0.	0.	0.1
	Relationships with colleagues *(reward)*	-0.3	-0.3	-0.3	-0.2	0.0	0.1
	(value)	-0.6 **	-0.5**	-0.4	-0.3*	-0.3	-0.2
	Responsibility for student progress *(reward)*	0.1	0.1	-0.4	-0.3	-0.2	0.2
	(value)	0.1	0.2	-0.5	-0.4**	-0.1	-0.1
	Student characteristics *(reward)*	-0.2	-0.2	0.0	0.	0.4	0.3
	(value)	-0.29	-0.31	0.07	-0.01	0.14	0.19
	Work content *(reward)*	-0.24	-0.25	-0.06	-0.03	-0.04	-0.11
	(value)	-0.3	-0.3	-0.1	-0.	-0.1	-0.2
	Work load *(reward)*	-0.1	-0.07	-0.24	-0.20	0.03	-0.05
	(value)	-0.6*	-0.6**	-0.1	-0.1	0.1	0.1

Table A16.76: Relationship between Chemistry teacher reward/value scales and student attitude to science as a career (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Management and morale (value)		
Pupil level		
Intercept	0.5***	
Student gender	-0.2*	-0.1*
Class/school level		
Management and morale (value)	-0.3	
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.6***	
Deviance	1452.0	
	1461.0	
	9.0*(d.f.=2)	
Material rewards (value)		
Pupil level		
Intercept	0.8***	
Student gender	-0.2*	-0.1 *
Class/school level		
Material rewards (value)	-0.6*	-0.1*
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.6***	
Deviance	1450.7	
	1461.0	
	10.3** (d.f.=2)	

Table A16.76 (Continued):

Personal and professional development (value)		
Pupil level		
Intercept	0.7***	
Student gender	-0.1*	-0.1*
Class/school level		
Personal and professional development (value)	-0.5*	-0.010*
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.6***	
Deviance	1449.6	
	1461.0	
	114 **(d.f.=2)	
Relationships with colleagues (value)		
Pupil level		
Intercept	0.6***	
Student gender	-0.1*	-0.1*
Class/school level		
Relationships with colleagues (value)	-0.4*	-0.1*
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.6***	
Deviance	1449.3	
	1461.0	
	11.7**(d.f.=2)	
Work load (value)		
Pupil level		
Intercept	0.7***	
Student gender	-0.1*	-0.01*
Class/school level		
Work load (value)	-0.5*	-0.1*
Random part	**Variance components**	
Class level variance (σ^{00})	0.00	
Student level (σ^2)	0.7***	
Deviance	1449.4	
	1461.0	
	11.6**(d.f.=2)	

Table A16.77: Relationship between Biology teacher reward/value scales and student attitude to science as a career (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Relationships with colleagues (value)		
Pupil level		
Intercept	0.5***	
Student gender	-0.2*	-0.1*
Class/school level		
Relationships with colleagues (value)	-0.2	
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.6***	
Deviance	1452.6	
	1461.0	
	8.4*(d.f.=2)	
Responsibility for student progress (value)		
Pupil level		
Intercept	0.0	
Student gender	-0.2**	-0.1**
Class/school level		
Responsibility for student progress (value)	0.3	
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	0.6***	
Deviance	1453.8	
	1461.0	
	7.2* (d.f.=2)	

Hypothesis 9: Teacher reports of job characteristic rewards and/or values are associated with student achievement.

Table A16.78: Significant relationships with between job characteristic reward and value measurements and student achievement (preliminary analysis)

Dependent variable	*ndependent explanatory variable*	CHEMISTRY		BIOLOGY		PHYSICS	
		CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)
Independent test score	Administrative responsibility *(reward)*	-0.2	-0.9	0.1	0.3	0.1	0.1
	(value)	0.1	0.1	-0.1	-0.4	0.	0.6
	Career advancement *(reward)*	-0.2	-0.5	0.	1.0	0.5	0.
	(value)	0.2	0.7	-0.4	-6.6*	-0.1	-0.1
	Community school relations *(reward)*	0.1	0.4	0.3	1.4	0.6*	1.0
	(value)	0.0	0.2	-0.1	-0.9	0.3	1.1
	Management and morale *(reward)*	0.	0.2	0.	1.3	0.6	1.3**
	(value)	-0.2	-0.9	0.01	1.6	0.1	0.3
	Material rewards *(reward)*	0.4	0.4	0.2	1.2	0.7**	1.7***
	(value)	0.1	0.8	-0.1	-2.1	0.1	0.4
	Personal and professional development *(reward)*	0.2	0.6	0.3	1.6	0.3	0.6
	(value)	-0.3	-2.0	-0.1	-0.9	-0.1	-0.1
	Physical working conditions *(reward)*	0.4	1.9	0.1	0.4	0.6*	1.4*
	(value)	-0.1	-0.6	0.0	0.1	0.1	0.6
	Relationships with colleagues *(reward)*	-0.2	-1.3	-0.3	-1.6	0.5	0.8
	(value)	0.20	1.06	-0.26	-1.75	0.28	0.57
	Responsibility for student progress *(reward)*	0.0	0.0	-0.1	-0.5	0.2	0.5
	(value)	0.4	3.5	-0.4	-2.4	0.3	1.0
	Student characteristics *(reward)*	0.1	0.4	0.1	1.1	0.5	1.7**
	(value)	0.1	0.6	-0.2	-3.5	0.3	3.1
	Work content *(reward)*	0.0	0.3	-0.2	-1.51	-0.4	-2.0
	(value)	0.0	-0.1	-0.2	-3.2	-0.1	-0.2
	Work load *(reward)*	-0.2	-1.1	-0.2	-1.9	0.4	0.8
	(value)	0.0	0.0	0.1	1.0	0.3	1.5

Table A16.79: Relationship between Physics teacher reward/value scales and student independent test score in Physics (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Management and morale (reward)		
Pupil level		
Intercept	6.3**	
Student age	-0.2	
Student ability	0.04**	0.1**
Class/school level		
Management and morale (reward)	0.9**	0.1**
Location	-0.3	
School administration	-0.2	
School fees (group 1)	-0.5	
School fees (group 2)	-0.7	
Number of schools in which a teacher works	0.9**	0.2 **
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	3.4***	
Deviance	2116.2	
	2143.5	
	27.3***(d.f.=8)	
Material rewards (reward)		
Pupil level		
Intercept	6.0**	
Student age	-0.20	
Student ability	0.04**	0.1**
Class/school level		
Material rewards (reward)	1.4***	0.2***
Location	-0.49*	-0.1*
School administration	0.2	
School fees (group 1)	-0.1	
School fees (group 2)	-0.5	
Number of schools in which a teacher works	1.0***	0.3***
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	3.4***	
Deviance	2122.7	
	2143.5	
	20.8**(d.f.=8)	

Table A16.79 (Continued)

Physical working conditions (reward)		
Pupil level		
Intercept	5.9**	
Student age	-0.2	
Student ability	0.1**	0.2**
Class/school level		
Physical working conditions (reward)	1.3**	0.1**
Location	-0.3	
School administration	0.4	
School fees (group 1)	-0.0	
School fees (group 2)	-0.2	
Number of schools in which a teacher works	1.1***	0.3***
Random part	**Variance components**	
Class level variance (σ^{00})	0.	
Student level (σ^2)	3.4***	
Deviance	2115.2	
	2143.5	
	28.3***(d.f.=8)	
Student characteristics (reward)		
Pupil level		
Intercept	5.5*	
Student age	-0.2	
Student ability	0.1**	0.2**
Class/school level		
Student characteristics (reward)	2.0**	0.2**
Location	-0.4	
School administration	0.2	
School fees (group 1)	0.2	
School fees (group 2)	-0.5	
Number of schools in which a teacher works	0.6	
Random part	**Variance components**	
Class level variance (σ^{00})	0.0	
Student level (σ^2)	3.4***	
Deviance	2116.5	
	2143.5	
	27.1***(d.f.=8)	

Table A16.80: Relationship between Physics teacher reward/value scales and student independent test score in Physics (CUA)

CUA	Standardised regression coefficients	Percentage explained variance
Community school relations (reward)		
Student age	n.s.	
Student ability	0.5*	
Community school relations (reward)	n.s.	
Location	n.s.	
School administration	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	
Number of schools in which a teacher works	-0.6**	66.0%
Material rewards (reward)		
Student age	n.s.	
Student ability	n.s.	
Material rewards (reward)	0.5*	
Location	n.s.	
School administration	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	
Number of schools in which a teacher works	0.5*	68.8%
Physical working conditions (reward)		
Student age	n.s.	
Student ability	n.s.	
Physical working conditions (reward)	0.6**	
Location	n.s.	
School administration	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	
Number of schools in which a teacher works	0.7**	75.0%

Table A16.81: Relationship between Biology teacher reward/value scales and student independent test score in Biology (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Career advancement (value)		
Pupil level		
Intercept	7.3*	
Student age	0.0	
Father's education (group 1)	0.1	
Father's education (group 2)	-0.3	
Mother's education (group 1)	0.4	
Mother's education (group 2)	0.4	
Income per student family member	0.0	
Student ability	0.1***	0.2***
Class/school level		
Career advancement (value)	-5.1**	-0.2**
Location	0.7	
School administration	-2.0**	-0.4**
School fees (group 1)	-0.7	
School fees (group 2)	-0.3	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2	
Student level (σ^2)	3.7***	
Deviance	1651.4	
	1699.1	
	47.7***(d.f.=12)	

Table A16.82: Significant relationships with between job characteristic reward and value measurements and student term marks (preliminary analysis)

Dependent variable	ndependent explanatory ariable	CHEMISTRY		BIOLOGY		PHYSICS	
		CUA (Unconditional model	MLM (Unconditional model	CUA (Unconditional model)	MLM (Unconditional model)	CUA (Unconditional model)	MLM (Unconditional model)
Term marks	Administrative responsibility *(reward)*	0.2	0.3	0.0	-0.1	0.1	0.2
	value)	0.2	0.4	0.0	0.0	-0.1	-0.2
	areer advancement *(reward)*	0.2	0.36	0.24	0.32	0.60*	1.15**
	value)	-0.1	-0.1	-0.2	-1.2	0.2	0.8
	ommunity school relations *reward)*	0.0	0.1	0.3	0.5	0.4	0.8
	(value)	0.0	0.0	-0.1	-0.4	0.1	0.2
	anagement and morale *reward)*	0.0	0.0	0.2	0.5	0.5*	1.2
	value)	-0.4	-1.1*	-0.1	-0.7	0.4	1.2
	aterial rewards *(reward)*	0.2	0.1	0.4	0.9	0.3	0.7
	value)	-0.2	-0.6	0.0	0.3	0.0	0.1
	ersonal and professional evelopment *(reward)*	-0.1	-0.3	0.0	-0.1	0.2	0.5
	value)	-0.3	-0.8	-0.1	-0.3	0.1	0.2
	hysical working conditions *reward)*	0.1	0.3	0.2	0.4	0.3	0.9
	value)	-0.1	-0.4	0.3	1.2	0.1	0.3
	elationships with colleagues *reward)*	0.0	-0.1	0.2	0.4	0.6*	1.2**
	value)	-0.1	-0.2	0.1	0.3	0.5*	1.3*
	esponsibility for student rogress *(reward)*	-0.2	-0.4	0.2	0.3	0.2	0.6
	value)	-0.2	-0.9	-0.1	-0.3	0.2	1.1
	tudent characteristics *reward)*	-0.1	-0.3	-0.3	-1.1	-0.1	-0.4
	value)	-0.3	-1.0	-0.3	-2.7	0.0	0.3
	ork content *(reward)*	-0.8***	-2.2***	-0.1	-0.4	0.0	0.0
	value)	-0.6*	-1.8**	0.2	-1.2	-0.1	-1.7
	ork load *(reward)*	-0.1	-0.1	0.0	-0.1	-0.2	-0.7
	value)	-0.2	-0.6	0.0	0.1	-0.1	-0.5

Table A16.83: Relationship between Chemistry teacher reward/value scales and student term marks in Chemistry (MLM)

Fixed part	Unstandardised regression coefficients	Standardised values of significant coefficients
Management and morale (value)		
Pupil level		
Intercept	8.4***	
Student age	-0.2***	-0.2***
Student ability	0.03***	0.2***
Student gender	0.0	
Class/school level		
Management and morale (value)	-1.1	
Location	0.3	
School administration	-0.7	
School fees (group 1)	-1.0*	-0.5*
School fees (group 2)	-0.7	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2**	
Student level (σ^2)	0.6***	
Deviance	1412.6	
	1473.3	
	61.0***(d.f.=8)	
Work content (reward)		
Pupil level		
Intercept	9.0***	
Student age	-0.2***	-0.2***
Student ability	0.03***	0.2***
Student gender	0.0	
Class/school level		
Work content (reward)	-2.3***	-0.5***
Location	-0.0	
School administration	-0.2	
School fees (group 1)	-0.6	
School fees (group 2)	-0.3	
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.6***	
Deviance	1402.8	
	1473.3	
	70.5***(d.f.=8)	
Work content (value)		
Pupil level		
Intercept	8.9***	
Student age	-0.2***	-0.2***
Student ability	0.03***	0.2***
Student gender	0.0	
Class/school level		
Work content (value)	-1.8**	-0.3**
Location	0.4	
School administration	-0.7*	-0.4*
School fees (group 1)	-0.8*	-0.4*
School fees (group 2)	-1.0**	-0.5**
Random part	**Variance components**	
Class level variance (σ^{00})	0.1*	
Student level (σ^2)	0.6***	
Deviance	1407.7	
	1473.3	
	66.0***(d.f.=8)	

Table A16.84: Relationship between Chemistry teacher reward/value scales and student term marks in Chemistry (CUA)

CUA	Standardised regression coefficients	Percentage explained variance
Work content (reward)		
Student age	n.s.	
Student ability	n.s.	
Student gender	n.s.	
Work content (reward)	-0.8***	
Location	n.s.	
School administration	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	62.5%
Work content (value)		
Student age	n.s.	
Student ability	n.s.	
Student gender	n.s.	
Work content (value)	-0.6*	
Location	n.s.	
School administration	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	35.9%

Table A16.85: Relationship between Physics teacher reward/value scales and student term marks in Physics (MLM)

Fixed part	Unstandardised regressio coefficients	Standardised values of significant coefficients
Career advancement (reward)		
Pupil level		
Intercept	5.7***	
Student age	-0.2**	-0.1**
Student ability	0.03***	0.2***
Student gender	-0.1	
Income per student family member	0.0	
Class/school level		
Career advancement (reward)	1.1**	0.3**
Location	-0.1	
School fees (group 1)	0.1	
School fees (group 2)	-0.4	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2*	
Student level (σ^2)	0.7**	
Deviance	1392.2	
	1431.5	
	39.4***(d.f.=8)	
Management and morale (reward)		
Pupil level		
Intercept	5.5***	
Student age	-0.2**	-0.1**
Student ability	0.03***	0.2***
Student gender	-0.1	
Income per student family member	0.0	
Class/school level		
Management and morale (reward)	1.2*	0.3*
Location	-0.2	
School fees (group 1)	0.0	
School fees (group 2)	-0.3	
Random part	**Variance components**	
Class level variance (σ^{00})	0.2*	
Student level (σ^2)	0.7***	
Deviance	1394.2	
	1431.53	
	37.3***(d.f.=8)	

Table A16.85(Continued)

Relationships with colleagues (reward)		
Pupil level		
Intercept	5.4***	
Student age	-0.2**	-0.1**
Student ability	0.03***	0.2***
Student gender	-0.1	
Income per student family member	0.0	
Class/school level		
Relationships with colleagues (reward)	1.1*	0.3*
Location	-0.1	
School fees (group 1)	0.0	
School fees (group 2)	**-0.1**	
Random part	**Variance components**	
Class level variance (σ^{00})	0.21*	
Student level (σ^2)	0.7***	
Deviance	1393.2	
	1431.5	
	38.3***(d.f.=8)	
Relationships with colleagues (value)		
Pupil level		
Intercept	5.1***	
Student age	-0.2**	-0.1*
Student ability	0.03***	0.2***
Student gender	-0.1	
Income per student family member	0.0	
Class/school level		
Relationships with colleagues (value)	1.1*	0.3*
Location	0.0	
School fees (group 1)	0.3	
School fees (group 2)	-0.1	
Random part		
Class level variance (σ^{00})	0.2*	
Student level (σ^2)	0.7***	
Deviance	1394.6	
	1431.5	
	37.0***(d.f.=8)	

Table A16.86: Relationship between Physics teacher reward/value scales and student term marks in Physics (CUA)

CUA	Standardised regression coefficients	Percentage explained variance
Career advancement (reward)		
Student age	n.s.	
Student ability	n.s.	
Student gender	n.s.	
Income per student family member	n.s.	
Career advancement (reward)	0.6*	
Location	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	34.4%
Management and morale (reward)	n.s.	
Student age	n.s.	
Student ability	n.s.	
Student gender	n.s.	
Income per student family member	n.s.	
Management and morale (reward)	n.s.	
Location	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	0.0%
Relationship with colleagues (reward)		
Student age	n.s.	
Student ability	n.s.	
Student gender	n.s.	
Income per student family member	n.s.	
Relationship with colleagues (reward)	0.6*	
Location	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	33.7%
Relationship with colleagues (value)		
Student age	n.s.	
Student ability	n.s.	
Student gender	n.s.	
Income per student family member	n.s.	
Relationship with colleagues (value)	0.6*	
Location	n.s.	
School fees (group 1)	n.s.	
School fees (group 2)	n.s.	31.3%

APPENDIX 17 FULL ANALYSIS OF DISTRIBUTION OF STUDENT THOUGHTS ON TEACHER JOB SATISFACTION CATEGORIES BY GROUP CATEGORIES (CHAPTER 9)

Table A17.01: Distribution of student responses based on school administration and location.

	Grouping	*School administration*			*Location of school*		
Category		*Municipal (% of 27)*	**Private Subsidised (% of 43)**	*χ^2 statistic (d.f.=1)*	*La Serena (% of 49)*	*Coquimbo (% of 21)*	*χ^2 statistic (d.f.=1)*
Category 1: Teacher choice		41	21	3.2	20	48	5.3*
Category 2: Classroom practice	**Category 2a: Style of class**	37	26	1.0	37	14	3.5
	Category 2b: Concern teacher shows in the class	22	23	0.0	29	10	3.0
	Total	48	44	0.1	51	33	1.9
Category 3: Inferences from student behaviour or outcomes		15	35	3.4	31	19	1.0
Category 4: Teacher mood		26	35	0.6	33	29	0.1
Category 5: Teacher shows liking of teaching		15	28	1.6	19	25	0.3
Category 6:Teacher motivation		15	16	0.0	12	24	1.5
Category 7: Teacher shows interest in subject		7	12	0.3	19	6	2.7
Category 8:Teacher expectations		4	5	0.0	41	5	0.0
Category 9: Direct complaint		4	5	0.0	6	0	1.3
Category 10: Would be trying harder		0	5	1.3	4	0	0.9

Table A17.02: Distribution of student responses based on father's education and school fee.

	Grouping	*Father's education*				*School fee*			
Category		*Group 1*	*Group 2*	*Group 3*	*χ^2 statistic (d.f.=2)*	*Group 1 (% of 19)*	*Group 2 (% of 21)*	*Group 3 (% of 30)*	*χ^2 statistic (d.f.=2)*
Category 1: Teacher choice		20	37	25	1.4	32	14	37	3.2
Category 2: Classroom practice	**Category 2a: Style of class**	15	26	58	6.4*	47	43	20	0.1
	Category 2b: Concern teacher shows in the class	5	26	25	3.6	32	19	20	1.9
	Total	30	37	67	4.4	53	43	20	1.1
Category 3: Inferences from student behaviour or outcomes		25	42	25	1.6	42	33	13	5.5
Category 4: Teacher mood		30	16	42	0.5	32	38	27	0.8
Category 5: Teacher shows liking of teaching		15	21	17	0.3	21	29	20	0.6
Category 6:Teacher motivation		20	16	17	0.1	5	24	17	2.6
Category 7: Teacher shows interest in subject		5	16	8	1.3	21	5	7	3.6
Category 8:Teacher expectations		0	0	8	3.3	5	0	7	1.4
Category 9: Direct complaint		10	0	0	3.2	5	5	3	0.1
Category 10: Would be trying harder		5	5	0	0.6	0	10	0	4.8

Table A17.03: Distribution of student responses based on student gender

	Grouping	*Gender*		
Category		*Male (% of 39)*	*Female (% of 31)*	*χ^2 statistic (d.f.=1)*
Category 1: Teacher choice		31	26	0.2
Category 2: Classroom practice	**Category 2a: Style of class**	35	26	0.8
	Category 2b: Concern teacher shows in the class	18	29	0.8
Total		41	48	1.2
Category 3: Inferences from student behaviour or outcomes		21	35	2.0
Category 4: Teacher mood		33	29	0.1
Category 5: Teacher shows liking of teaching		18	29	1.2
Category 6:Teacher motivation		13	19	0.6
Category 7: Teacher shows interest in subject		3	19	5.4*
Category 8:Teacher expectations		3	6	0.6
Category 9: Direct complaint		5	3	0.2
Category 10: Would be trying harder		3	3	0.0