Science and Mathematics Education Centre

Students' and Teachers' Perceptions of Effective Teaching and Learning in the Middle Level Science Classroom: The Effects on Student Achievement

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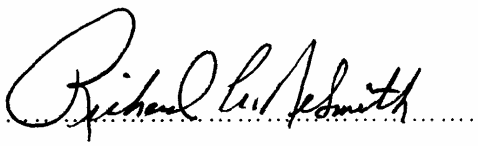
DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

Signature: 

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ABSTRACT

The major purpose of the study was to examine the relationship between teacher-student interpersonal behaviour in the middle level of schooling with the students' academic achievement in science as determined by the term grade (typically issued after a six or nine week grading period). The study also provided validation data for the Questionnaire on Teacher Interactions (QTI) survey instrument with a large American sample of students and teachers drawn from randomly selected the State of Ohio schools. The QTI was designed to elicit students' and teachers' perspectives of effective teaching and learning in classrooms. Numerous studies, here and abroad, during the last five years and have caused awareness that students' perceptions of their school experience are a significant influence on how and what students learn in the classroom.

Few studies have been conducted on the topic of student perceptions in *comparison* to their respective teachers' perceptions in science or how this variance might influence student achievement. The focus of the present study was to compare the perceptions of students and their teachers regarding effective teaching and learning, while concurrently noting students' achievement in science. This study presumed that there was a definite disparity between what teachers perceive to be effective teaching and learning in comparison to what students perceive. The intention of the study was to identify some of the factors associated with any disparity. The hypothesis for the study, simply stated, was that student achievement, according to student's accumulative grade, would reflect a variance in perception with that of their science teacher. Restated, the student's perception of effective teaching and learning could demonstrate to be a strong indicator of academic success or failure, depending upon the extent of difference with their respective teachers'. The research design of the study was based on the survey research method incorporating: 1) student and teacher questionnaires; 2) student and teacher interviews and; 3) students' science achievement, as measured in a teacher-issued grade.

A probability sample of 433 middle school students was surveyed using the 48-item short form of the Australian version of the QTI (Wubbels, 1993). This sample comprised 21 middle level science classes, ranging from grade 5 through grade 9.

Twelve cooperating science teachers associated with the teaching of science to these students were also surveyed using Questionnaire on Teacher Interaction (QTI). In addition, random interviews were conducted using interview logs with 6 teachers and 6 students selected from a convenience sample of those also responding to the questionnaire. Another major component of the research design was the term grade recorded by the cooperating science teacher, as a means of gauging "student academic achievement".

All student and teacher questionnaire data were statistically analysed using Microsoft Excel 2000 and the Statistical Package for Social Science (SPSS) for Windows 1999. The analysis was according to the proper categories in the QTI based on leadership, helpful/friendly, understanding, student responsibility and freedom, uncertain, and dissatisfied, admonishing and strict behaviour established in the QTI. The use of both qualitative and quantitative data collection methods from a range of data sources provided a means of triangulation to strengthen the validity of the findings, which thus afforded a means of comparing data consistency and cross validation for the purpose of improving the rigour of the research design.

As a means of collecting empirical data, schools were randomly chosen (probability sample) from the 20001-2002 Ohio Educational Directory, a directory produced by the Ohio Department of Education. Thirty-three schools were drawn. Between October 20002 and January 2003, each school was sent two letters inviting their participation in the study; one letter was sent to the on-site principal and one to the "head science teacher". Five weeks from the date the original letter was sent out to those not responding. Eventually, twenty-one classes returned their surveys for analysis. The Questionnaire of Teacher Interaction (QTI) was chosen due to its record of validity and its ease of administering. The qualitative data were tallied and recorded. The quantitative data analysis was completed using both manual and computerised methods to address the objectives of this study.

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CHAPTER 1

CONTEXT OF THE STUDY

With the United States of America (USA) grappling with State and Federal Educational Reforms, state standards, and standards proposed by various scholarly societies (Rakow, 2000), it is vital that we give due notice to students' needs, their perceptions about teaching and learning, and how to improve their learning experience (i.e., their success at school). The USA needs a skilled and talented population of students who will contribute to the country's economic growth and improve vital areas of importance to the nation, especially in the area of science. Because Federal spending on K-12 education is greater, being nearly 22.5 billion dollars in 2002, in conjunction with the Federal plan *No Child Left Behind*, each State is mandated to provide both statements of standards across all areas of learning and proper testing and assessment of students in meeting these standards. With such a *standards-centred* approach to education one may find that spending more money on education is not a guarantee to improve learning. The emphasis in educational policy needs to be on learning, not standards, and teachers need to become more "learning-centred" as opposed to "standard-centred". Standards, like memorization, will never raise the level of thinking a student is capable of whereas, research has indicated that emphases on greater effectiveness in how one learns can (Tobin, Kahle, & Fraser, 1990). It is important that we seek to understand the interpersonal relationship that occurs between students and their teachers. This study provides a small step toward understanding the learning process that takes place in the interaction between the teacher and the student in middle level science classrooms.

As classrooms become more socially and culturally diversified, understanding students' different perceptions about science learning and teaching would provide educators with valuable information upon which to improve instruction and learning. Multicultural classrooms are more prevalent today than ever before in the history of the USA (Appleby, 1996; Klauke, 1989; *The World Factbook*, 2002). What, and how, a student perceives the world is often flavoured by their respective culture(s), and therefore, students' perception of the world and of learning should be very important to classroom teachers. It is possible that simply taking notice of students'

opinions will have a positive instructional effect in, and of, itself. Culture and cultural mores, for example, have shown to be very important factors in the aspect of motivation and learning. Even listening to others share and contributing have shown to have an eventual effect (i.e., Hawthorne Effect, Roethlisberger & Dickson, 1939) on people.

Origin of the Study

As a classroom teacher for nearly nine years, I found very early in my career that as I changed in my own level of expertise, attitude, and efficacy, my students likewise seemed to change. I found that my attention and concerns evolved from "content-centred" to "student-centred" to "learning-centred". As a result, students became more productive and seemed to even enjoy my classes more. They even became more pleasant to work with, and I become more fulfilled as a teacher. My personal experience as a secondary science teacher convincingly suggested to me that students were not just able to be productive "scientists" but even the nonchalant students could be motivated to assume the responsibility to learn in a science-oriented learning environment. My curiosity grew as I spoke with colleagues about my observations. Oftentimes, I discovered that a student, who was blasé for a fellow-teacher, might be very proactive, or at least "average" in achievement in their work for me. I soon began to realise there must be factors or interactions involved between the student and teacher that resulted in either a positive or negative effect on student achievement.

After having taught for six or seven years, this variance between levels of student motivation, achievement, and cooperation became more apparent. My curiosity was stimulated enough that I began my own search for explanations for my perceived "success" as a science teacher. My research, in the most basic and casual fashion, led me to become a student of the *teaching-learning process*. I have grown to believe this concept is often ignored and should be studied as a vital element in teaching and instruction. The classroom learning environment contains gems for those who patiently seek them. In my experience, I have found that there is a relational variance between student and teacher with that of the student's achievement, to be present across education boundaries as a middle school science teacher, a high school

science teacher, and now at the tertiary level as a teacher-educator preparing future science and mathematics teachers. As a result of having taught in schools in the United States and Australia, I believe that the dynamics of a learning environment traverses cultural boundaries.

During my years as a classroom teacher I had the opportunity to investigate and determine what "worked best for me". These opportunities, however, were haphazard, at best, and I needed a more disciplined and systematic approaches to studying the interactions between student and teacher in order to more fully understand and appreciate the learning process. After much observation, reading, and contemplation, I attempted to begin my journey by listening to what students had to say about the interactions between teaching and learning, and student and teacher. Student perceptions of these interactions became very important to me (though at that time this concept seemed rather insignificant to most American researchers). I saw the *perception* of students as "gems" to be placed under the researcher's microscope for the purpose of revealing, describing, clarifying, and comprehending the dynamics that transpires in every classroom during the process we call "education". To be able to decipher even some of the dynamics that occurs between a teacher and a student would be very worthy of investigation, especially should a relationship between the variance of the two perceptions be established. The personal and interpersonal interactions between the teacher and the students, both as individuals and as a group, comprise a large part of what happens in the learning environment that schools provides (Arowosafe & Irvin, 1992; Ferguson, 1998; Kramer, 1992; Rickards, 1998). These "relationships" typically last for only one year, and yet seem to have such lasting effects; either positive or negative, on the students' perceptions of learning and teaching. Nearly every adult can remember various aspects of their learning regarding past teachers. For some these are positive and tend to encourage and motivate, but for others these are quite negative experiences and tend to daunt, if not haunt them. I was eager to begin my own formal research into science classroom teaching and learning.

Background of this Study

In 1997, as a part of a post-master's thesis for a Specialist in Education degree, I examined middle school students' perceptions regarding effective teaching and

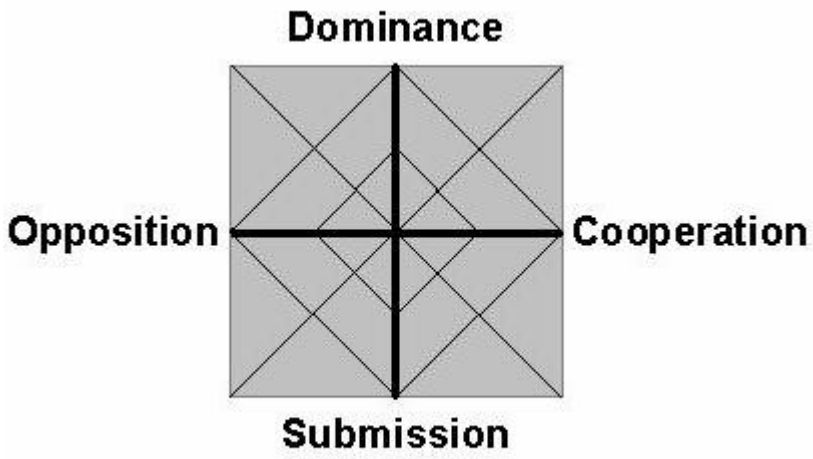
learning (NeSmith, 1997). The results were illuminating in that this study ascertained that not only do pre-adolescents have definite perceptions of effective teaching and learning practices, but they also tend to have several issues of dissonance and contradiction regarding this "transitional period" of schooling. The study provided evidence to support this concept as noted in the earlier works of Arowosafe and Irvin (1992), Callahan, Clark, and Kellough (2002), Delisio (2002), Ferguson (1998), Midgley and Urdan (1992), and the joint report of the National Middle School Association and the National Association of Elementary School Principals, entitled, *Supporting students in their transition to middle school* (n.d.). This transition period is possibly the outcome of the notion proposed by Stanley Hall (1904) that adolescence is a period of "storm and stress".

In the 1997 study, 148 middle grade level students in Georgia (USA) were surveyed to determine *how* middle school students perceived effective teaching and learning, but neglected to determine teachers' perception of effective learning or how it might affect student achievement. Therefore, the purpose of a follow-up study was set. The present study compared students' perception of teaching and learning with that of the teachers' perception of effective teaching and learning, and whether this might have effect on student achievement as denoted by the students' six or nine weeks science grade. Teachers' concepts regarding effective teaching and learning provided useful information on what Wubbels and Brekelmans (1998) referred to as teacher factors. The obvious question for me then became how much influence does a difference in one's perception make?

According to Wenglinsky (2003) "there has been little quantitative research into whether classroom practices, in concert with other teacher characteristics, have an impact on student learning that is comparable in size to that from background characteristics" (p. 6). The current study sought to begin filling the gap in the literature by using both quantitative and qualitative methods to study the impact on teacher perceptions and interactions of effective teaching and learning on student academic achievement. The elements involved in the action we call "teaching" and "learning" are multifaceted and somewhat illusional due to the impression that everyone "knows" what effective teaching and learning are, but no one can agree on how they are achieved. What may prove to be helpful, however, is whether the

different perceptions of effective teaching and learning are, indeed, a factor in student achievement. The complexity of the issue should not discourage the researcher from attempting to put together the research puzzle one piece at a time. This study, therefore, attempted to examine some specific part of the puzzle, namely, whether the degree of similarity or difference between that of a student and teacher's perception of effective teaching and learning is a factor on the student's achievement, as indicated by a student's grade. It also postulated that those students who are more similar in perception of effective teaching and learning with that of their teachers' will score higher than those students whose perceptions of effective teaching and learning are more dissimilar. The *Questionnaire on Teacher Interaction,* or QTI was utilized to provide a means of determining the interactions between teacher and students.

Figure 1.1. The four domains addressed by the QTI



The QTI was the main instrument used in this study. It had divides responses into four classroom dimensions: dominance, opposition, cooperation, and submission (see Figure 1.1). The eight sectors within theses four dimensions of the QTI are: leadership, helpful/friendly, understanding, student responsibility and freedom, uncertain, and dissatisfied, admonishing and strict behaviour (see Table 1.1). Superimposing the sectors over the proximity dimensions creates an octagonal figure with the four proximity dimensions on the outside of the geometric figure (see Figure 1.1). Thus, dominance is being considered opposite that of submission, and

cooperation that of opposition. The sectors within the octagon then further define the proximity dimensions. For instance, in the dimension of dominance, one can sway to the left towards opposition or to the right towards cooperation. This will be discussed further in light of the analysis of the data gathered in the study. It is suffice to state at this time that the statistical analysis of the QTI for internal consistency has satisfactory reliability (Wubbels, 1993). The QTI scales range from 0.76 to 0.84 for student responses and 0.74 to 0.84 for teacher responses (Fisher, Rickards, & Fraser, 1996).

Table 1.1. Description of each scale addressed by the QTI

Domain and sectors addressed in the QTI		QTI Item number	
Cooperation	Opposition	Dominance	Submission
Understanding	*Admonishing*	*Leadership*	*Uncertain*
Helpful/Friendly	*Dissatisfied*	*Strict Behaviour*	*Student Responsibility & Freedom*

This study is unique in that it combines the dimensions under the appropriate sectors of the QTI with a Midwestern American sample. After an exhaustive search I found no evidence that the QTI had been administered to a large sample of Ohio (USA) middle school students, therefore, this study was conducted using a probability sampling of 433 middle school students in the State of Ohio, to ascertain how students and teachers perceive their respective classroom learning environment. Interviews also were conducted with students and teachers to provide a means of comparison between survey results and what interviewees (both teachers and students) actually said.

Purpose of the Study

Statement of the problem

The purpose of the study was to identify whether a relationship exists between a student's academic achievement with that of the perception that both teacher and students might have regarding effective teaching and learning. It was important to establish student perceptions and teacher perceptions in order to compare one with the

other. The study sampled government and private schools in the State of Ohio, which were randomly selected, and are representatives of schools found throughout the State. Wenglinsky (2003) and Tobin (1994) have highlighted the need for more research in the area of student perceptions regarding student learning. Duit, Treagust, and Fraser (1996), as well as Schunk and Meece (1992), have reported the importance of conceptualising student insights in science instruction by studying students' ways of thinking and understanding. This study sought to examine the differences in student and teacher perceptions and how this might influence student academic performance in middle school science classes, and whether this is a useful means of determining academic outcomes.

Research hypotheses and research questions

Therefore, the hypothesis for the study was:

> Student achievement, according to the students' (six or nine weeks) grade report, will reflect a correlational relationship with that of their respective teacher's perception.

If student perceptions, in comparison with teacher perceptions, provide a means of predicting student academic achievement, then the use of inventories soliciting such information would prove advantageous in improving learning and teaching in science classrooms. Based on this hypothesis three specific research questions were considered.

1. What are students' and teachers' perceptions about effective teaching and learning?

2. In what major ways, if any, do students' perceptions and teachers' perceptions differ?

3. In what ways do differences in student perceptions and teacher perceptions of effective teaching and learning have a significant effect on student achievement?

These questions will be addressed in greater detail in Chapter Four. Since these questions are contextually bound by various issues such as student perceptions, teacher perceptions, the middle schooling concept, the issue of out-of-field teachers, and science in the middle school, these issues will be addressed individually in Chapter Two.

Significance of the Study

The study was unique in that it focused on USA middle level secondary science classes in the State of Ohio. This study also was unique in that it involved a probability sample of students at the middle grade level and in science courses. There appear to be five perceived benefits from conducting a study which sought to determine how students and teachers differed in respect to perceptions of effective teaching and learning. These were as follows.

1. To determine whether there is a relationship between students' academic achievement with that of teacher perceptions of effective teaching and learning is vitally important for science educators, as well as for other disciplines (Callahan, Clark, & Kellough, 2002; Fraser & Fisher, 1982; Schunk, 1995).

2. Such a study would clarify whether the matching, or mismatching, of students' perceptions with teachers' hinders, facilitates, or has no effect on achieving science processing skills.

3. A study custom designed for middle school science would provide insight needed on *how* to train pre-service science teachers, as well as, how effective learning principles should be addressed in a science education methods unit.

4. This study also was distinct in that it sought to contribute to a better understanding of some of the key variables that might influence student attitudes, cognitive achievement, academic achievement, and hence involvement rates in middle school science.

Furthermore, this study has contributed to the literature in the study of teacher-student interpersonal behaviour in science classes by providing data for the QTI from a large base of survey responses from a Midwestern state in the USA. The information from this study will help serve the needs of classroom science teachers, school administrators, and educators who train pre-service science teachers, in improving the effectiveness of teaching and learning of science at the middle level.

Research Design of the Study

Theoretical framework of the study

Though Herbert Walberg pioneered the concept of classroom environment assessments over 30 years ago with the Harvard Project Physics (Anderson & Walberg, 1968; Walberg, 1968), Wubbels, Fraser, Tobin, and Fisher have provided valuable research and data in the area of classroom environment during the last 20 years (Fisher, & Fraser, 1990; Fisher, Rickards, & Fraser, 1996; Fraser, 1998a; Fraser, 1998b; Fraser, 1994c; Fraser, 1990d; Fraser & Fisher, 1983; Fraser & Fisher, 1982; Fraser & Tobin, 1991; Wubbels & Brekelmans, 1998; Wubbels, 1993). These studies are based on the use of the instrument created by Wubbels, which is referred to as the *Questionnaire on Teacher Interaction* (QTI) (Brekelmans, Wubbels, & Créton, 1990; Wubbels, 1993). This survey instrument, with some modifications, has been used internationally to assess student and teacher perceptions, in the Netherlands, Australia, Hong Kong, Singapore, and the USA. The modified QTI is a convenient questionnaire with 48 items comprising eight sectors which form four proximity dimensions (Wubbels, 1993). The four dimensions (or domains) include cooperation, opposition, dominance, and submission and form quadrants (refer to Figure 1.1). Each quadrant gradually blends into its respective border. For example, as one becomes less “dominant” they become more “cooperative”, and the antithesis of “dominant” is “submission”. Such a scale provides a more life-like realm that one’s behaviour, attitude, or dispositions can include some or all of the four proximity dimensions.

Overview of the methodology

This study followed the recent trend in science education research to combine qualitative and quantitative methods of data collection and analysis (Fraenkel & Wallen; 2003; Fraser & Walberg, 1995; Patton, 1990; Tobin & Fraser, 1998). This is sometimes described as a "mixed-method design", or triangulation, but the concept is simply that of having more than one type of data (quantitative and qualitative) in order to compare results to determine whether the findings support the other (Fraenkel & Wallen, 2003, p. 443). This concept of triangulation provided rigour and a means of trustworthiness in the study. By using multiple approaches, one can identify new problems and possible solutions.

The State of Ohio's educational system contains more than 800 school districts, 120,000 school teachers, and thousands of additional administrators, counsellors, and other professionals. In 2001, Ohio has approximately 1.76 million students in the combined public and private system, of which 806 schools service students in the middle level (middle school or junior high school) age, as reported in *Teachers' Supply and Demand in Ohio* (2001). Of this, it is estimated that approximately 500,000 students are in middle level years of education. The population for the study was the middle level student.

A sample of middle level science classes, ranging from grade 5 through grade 9 was selected from cooperating science teachers in the State of Ohio. The 48-item short form of the Australian version of the QTI (Wubbels, 1993) was administered and tallied according to the proper categories based on the eight sectors (leadership, helpful/friendly, understanding, student responsibility and freedom, uncertain, and dissatisfied, admonishing and strict behaviour). The survey also included an item to obtain from the teacher a science grade for each student surveyed. The student's grade was provided by the respective science teacher. This item caused no distraction to the student respondents. The qualitative data, in the form of interviews, were primarily a means of checking data consistency, as well as acting as a means to cross validate and further enrich the quantitative findings. Such an approach is recommended by Fraenkel and Wallen (2003), Merriam (1988), Putney, Green, Dixon, and Kelly (1999), Sowell (2001), Tobin and Fraser (1998).

Data analysis was completed using both manual and computerised methods to address the objectives of this study. Microsoft Excel 2000 (2001) and SPSS for Windows (SPSS, 1999) were used to examine the quantitative data. The interview data provided additional information for comparison with QTI results.

Overview of the thesis

This thesis consists of five chapters and eight appendices. The first chapter has introduced and summarised the purpose of this study and outlines the objectives, provided a brief overview of the methodology and discusses the significance of the study. Chapter Two reviews the supporting literature, describes student-teacher perception research, learning environment research, interpersonal behaviour research and the Questionnaire on Teacher Interaction. Chapter Three describes the methodology used in this study and outlines the research questions, sample, and measures used. Qualitative and quantitative methodologies are detailed. Chapter Four supplies validation and descriptive data, and discussion of general perceptions of students' in middle level science courses. Chapter Five presents student-teacher outcome variables and other measures, including the results and discussions of student-teacher perceptions and the associations between these and student achievement, and also reports conclusions and recommendations regarding the examination of student-teacher perceptions of effective teaching and learning. Future implications for future research are provided.

Chapter Summary

The first chapter has outlined the personal motivations that led me to the origin of this thesis. The next four sections detailed the background and rationale for this study along with the objectives, definitions, clarifications, and significance of this study. The limitations of this research were introduced here and will be concluded with the section covering future directions and further research in the final chapter of this thesis. Chapter One also provided an overview of the methodologies used in this study and presented an overview of the contents of each chapter contained in this thesis.

In the next chapter, an overview is provided of the various studies completed in the area of student perceptions, classroom environment and useful inventories, as well as a discussion regarding various issues and why they are important to this study. A greater focus will be made on the QTI survey instrument utilised in this study, as well as the findings of scholars who have sought to listen to what students are saying about effective teaching and learning.

CHAPTER 2

REVIEW OF THE LITERATURE POSITIONING THE STUDY

Introduction

The previous chapter provided an introduction of the origin and background to the study of teacher perceptions, student perceptions, the middle school concept, the theoretical framework, and the objectives for this study. The significance of the study, potential limitations, and an overview of both the methodology and the thesis were provided. Chapter Two exhaustively addresses the lineage of the problem and the theoretical constructs being applied within the research design. The principal aim of this study was to consider associations between teacher-student personal perceptions of learning and teaching, and its effect on student achievement. The first objective of this chapter is to establish a theoretical framework for the study by reviewing the literature on which studies of learning environments, student perceptions, and student achievement are based. The second objective is to review completed research in the areas of teacher-student interpersonal behaviour, student-teacher perceptions, and cognitive achievement of middle level students. This chapter concludes with a summary drawing on the presented literature in these areas. Literature supporting the validation and reliability of the QTI is also reviewed.

Research on Learning Environments

Student perceptions about learning

Until the mid-1980s only a small consideration had been given to the study of student perceptions. The practice of seeking a student's perception, or "person perception", as coined by psychologists and educators (Kramer, 1992, p. 28; Payne & Wenger, 1998, p. 409), came into acceptance and recognition that perceptions are realistic to the one perceiving and *may* provide vital information on the teaching-learning interaction.

The need for determining students' perspective in education was established in the theories and works of Fullan (1994, 1991), Wilson (1994), Hargreaves (1992), Dunn (1988), Sizer (1992), and Glasser (1997, 1986). Combs (1982), over three decades ago, emphasized the affective domain as being vital component of the education process. He believed proper education cannot be achieved apart from addressing both the cognitive and the affective domains; for the affective domain is concerned about student attitudes, feelings, and emotions. The student's motivation to learn new tasks is an affective characteristic, according to Bloom (1983). Sizer (1992), and the Coalition of Essential Schools movement, supported the initiative that educational goals will vary as students themselves vary, and that learning should be personalised to the maximum feasible extent. A generation ago, Buxon (1973) proposed changing the system to fit its students. The students' perceptions are vitally important in order to aid the student-school fit (Dunn, 1988; Eccles, Midgley, Wigfield, et al., 1993; Fraser & Fisher, 1983, Marcus, 2001), therefore making the process of learning more effective and efficient. Darling-Hammond (1996) affirmed that teachers have a complex job, and one expertise that they cannot afford to be without is an understanding of how students think and perceive learning. Kawasaki (1996) noted that the complexity of one's concept of science partly reflects one's national culture. "Perceptions can assist teachers," according to Dale Schunk "by showing how students think, which is useful for teaching" (personal communication, May 6, 1997). These theories are related to the impact of current reform and emphasize the need to consider the importance, educationally and socially, of knowing what students perceive, as compared to what we, as educators, hope they have perceived.

Goodlad (1984) and Schneider (1996), independently, noted that students' perceptions about learning are seldom sought, and students seldom make decisions about their own learning. According to Barell (1995), the criterion for effective learning is that students are in charge of their own learning; essentially, directing their own learning processes. One research team reasoned that adolescents base much of their efficacy on being responsible (Van Hoose & Strahan, 1988). It should be our goal as educators to develop students into self-regulated learners able to think and make intelligent decisions in order to manage change (Schunk, 1995). According to Costa (1984), students can learn to understand and articulate their mental processes *if* teachers specifically encourage thinking about thinking (i.e.,

metacognition). Van Hoose and Strahan (1988) hold that we, as educators, are to steer adolescents through the transitions of parent control, to peer control, on to the final goal of self-control (1988). Covey (1989) recognized the importance of self-directedness, which he called “proactivity” (p. 186). Barell (1995) noted that learning in schools is traditionally dominated and controlled by adults. Beane (1993) posited that even in the midst of educational reform, middle school educators are still having a disconcerted sense that while they have done a great deal by way of organizational work, there was still a void. To him, this missing void appeared to be student perceptions. When considering the curriculum, Beane (1993) surmised that appropriate curriculum begins with relevant, accurate, and up to date concepts...of which much could be learned from knowing what students perceive. In his work, *From Rhetoric to Reality*, Beane (1993) equated curriculum developed apart from the teachers and young people who experience it, was anti-democratic and disgustingly dictatorial. Maybe this should cause us to reconsider the process. Could it be that we just do not know how students actually perceive education? We assume their perceptions are those of our own. Little wonder students sense alienation, and even powerlessness, over what is happening to them academically (Oerlemans & Jenkins, 1988).

Since the mid-1990s, there has been a gradual, but significant, increase in the number of studies regarding student perceptions. More educational researchers are now attempting to study student perceptions in the classroom learning environment than at any other time in the history of American education. Recently, Wenglinsky (2003) analysed teacher classroom practices (teacher input and characteristic practices) with that of student academic performance. Campbell, Smith, Boulton-Lewis (2001) considered students’ approaches to learning in regard to their teachers’ approaches to teaching. Marchant, Paulson, and Rothlisberg (2001) studied student perceptions of family and school and how this affected academic achievement. These studies were centred principally upon the conceptual field of learning environments. Learning environments are components of the educational experience, and are constructed by individuals and groups of individuals in a given setting. Learning environments consist of socially-mediated beliefs about opportunities to learn and the extent to which those opportunities are constrained by the social and physical milieu (Ferguson & Fraser, 1996). Learning environments are not only constructs, but are

constructed by the interaction that occurs within a classroom between a teacher and students. It is within this environment that the foundation of learning transpires. This, however, is not to say that "learning necessarily follows from instruction" (Ahlgren, 2002, n.p.). However, student learning, according to Wenglinsky (2003), "is a product of the interaction between students and teachers, and both parties contribute to this interaction" (p. 7).

Cochran-Smith (2003) reminded us of the complexity involved in teaching and the mishap we create by attempting to over-simplify descriptions of the process. It was not the intent of this study to oversimplify effective teaching and learning, nor to provide the "silver bullet". "Effective teaching" is simply defined as the ability to help students learn, *effectively*. This issue in this study is not so much as *what is* effective teaching but rather *how* it bears on student achievement. Rather, the study sought to highlight one component of teaching which needed more consideration: perceptions. An understanding of student perceptions supplies the classroom science teacher with valuable data in which to modify one's approach to teaching. Most studies in student perceptions have taken place within the last ten years. In some sense, however, the study of student perceptions began with the study of learning how students construct knowledge (Naylor & Keogh, 1999). Educational researchers have reported on numerous occasions that students actively construct "knowledge on the basis of the knowledge they already hold" (Duit & Treagust, 1995, p. 49). Piaget (1929) pioneered the concept that students learn by constructing knowledge from their own personal experience. The reality that students construct their own meaning of an idea, concept or fact, is now referred to as constructivism. Constructivists recognised that a student's learning is not something that takes place in a vacuum, but rather is embedded in a particular "social setting" of which that individual is a participant, namely, the classroom learning environment (Duit & Treagust, 1995, p. 49; Wadsworth, 1996). Clearly, there is more to constructivism than the explanation just rendered, however, the recognition of this interaction between the student, the environment, and the information to be learned, is of vital importance in understanding the concept of "personal perception". Duit and Treagust (1995) said it well.

> If the teacher asks a question and students try to understand it, they are able to do this only from their perspective and on the basis of the conceptions that they hold. If these conceptions are different from those of the teacher, and this unusually is the case, the students make sense of the question in a way different from the teacher's way; the answer the students might give is interpreted by the teacher from his or her point of view. An endless circle of misunderstanding can occur in such communication situations, and these incidents frequently occur in teaching and learning. (p. 49)

Student perceptions about learning environments

Schunk and Meece (1992) considered that "there are many types of student perceptions that operate in the classroom" (p. xi). Students *learn*, consequently, when their concept, which is embedded in their own knowledge and evaluation of the environment, is compared and contrasted to that of their teacher's concept, which may, and typically is, from an entirely different environmental construct (Treagust, Duit, & Fraser, 1996). This construct of a class environment is a product of the interactivity that occurs within a class with a teacher and amongst peers. In a sense, a student's ability to learn is limited only to the degree to which a concept can be made personal. A personal concept is, therefore, a *percept*, or perception, which is identified by psychologists as, "person perception" (Payne & Wenger, 1998, p. 409; Kramer, 1992, p. 28). This provides legitimacy to the study of students' and teachers' perceptions. A student's perception provides him or her with tools in which to decipher, translate, construct, and make sense out of any given concept. "Prior knowledge," according to Lorsbach and Tobin (1997), "is used to make sense of data perceived by the senses" (n.p.). As students' perceptions, therefore, are real and accurate *for each individual student*. For example, what happens when a student perceives that a teacher does not like him when this perception is very real and factual to the student? It may not be true in reality, and in fact, the teacher may not feel that way at all about this student. The student's perception, however, will act as a filter through which the student will either limit or facilitate learning. Though Lorsbach and Tobin (1997) recommend using constructivism as a "referent", it seems highly appropriate here to suggest that a students' perception, is, indeed, their

referent to learning. Learning occurs through the senses and in the context of the environment in which the learner is a member. This places a great deal of importance and worth on student perceptions in the learning process. This study was unique in that student perceptions were solicited, as well as that of their teachers', providing a means of comparing the effect of the perceptions of both, student and teacher, on student achievement.

In discussing student perceptions on learning and teaching practices, Antonowich (1995) found that gifted middle school students perceived academic success *regardless* of the form of academic grouping practiced. Daniels, Kalkman, and McCombs (2001) established that primary students valued similar characteristics in teachers regardless of the classroom context. Marchant, Paulson, and Rothlisberg (2001) suggested that middle school students' perceptions were predicative of their academic achievement. Robison (2001) found that middle school students' reports of teacher supportiveness significantly predicted student science grades. This is a noteworthy concept and needs further investigation, for if student perceptions are predictor of academic achievement, then what perceptions determine success or failure academically, and what influence or contrast does that of the teachers' perception have on this interplay? It has been noted that students' perceptions are not usually the same as that of the educators'. In examining instructional teaching methods, Hagborg (1994) found that students tended to rate teacher methods as more limited and more dependent on teacher direction than did teachers, who saw their methods as broader and requiring more student participation. Indeed, Rickards and Fisher (1998) found that teacher and student perceptions vary greatly from one another and that teachers always give themselves higher ratings than do students.

The seeking of students' perceptions regarding their educational experiences may be a step in the right direction to improve the learning process. It certainly could be a step in a more effective and efficient direction towards a more constructivistic ideology of student learning based on student perceptions and experiences. In the current study, it was supposed that student perceptions' regarding effective teaching may not only be different from that of their respective science teacher, but also that the larger the disparity between the two perceptions of effective teaching and learning the greater the effect it would have on student achievement.

Student perceptions are vital components, among other factors, that interact with teaching and learning to create classroom learning environments. Teachers, recognising that students' perceptions are, indeed, mirror reflections of their perceived environment, will seek to provide an environment that is conducive to learning by endorsing effective teaching strategies (Honebein, 1996; Riesbeck, 1996). According to Wubbels and Brekelmans (1998), teacher observation instruments typically only seek to identify the observer perceptions of ongoing behaviours between *some specific number (n) of* students and the teacher. This perspective has been developed from the pioneering research of educators in the area of classroom environments (Aldridge & Fraser, 1997; Anderson & Walberg, 1968; Fraser, Anderson, & Walberg, 1982; Moos, 1968). Moos (1968) began his examination of the learning environment with the Harvard Project Physics (Walberg, 1968) and an instrument he constructed and called the Learning Environment Inventory (LEI). Questionnaires which assess the whole-class environment assume that there is a unique learning environment in the classroom that all students in a class, more or less, experience (McRobbie, Fisher, & Wong, 1998). Most of these instruments ask respondents questions about their experience within the classroom environment, in both a preferred and an actual version, focusing on the learning environment ideally preferred by students. This began the trial and error search of creating a credible inventory to measure classroom learning environments.

Linking student perceptions about learning and classroom environments

Why seek perceptions of students? Schunk and Meece (1992) defined "student perception" as involving "perceptions of students' own abilities, self-concepts, goals, competence, effort interests, attitudes, values, and emotions" (p. xi). Perceptions, therefore, have been defined in this study as how students perceive, distinguish, or make sense of the environment in which they interact. Callahan, Clark, and Kellough (2002) interrelated classroom environment, student perceptions, and learning. They proposed that "certain perceptions by students must be in place" (p. 162). Psychologists describe this concept of perception more specifically as "person perception" (Kramer, 1992; Payne & Wenger, 1998). Person perceptions are attributions made by individuals about events, situations, or personalities. Pintrick,

Cross, Kozma, and McKeachie (1986) have noted that an emphasis on student perceptions requires an assumption that students are active information processors who not only are affected by classroom events but have an effect on the events that occur in the classroom. This concept was originally proposed by Bandura (1978) as reciprocal determinism. Perceptions are very important for they affect the learner as well as the instructor (Callahan, Clark, & Kellough, 2002; Fisher & Rickards, 1998; Friedel, Marachi, & Midgley, 2002; Rickards & Fraser, 1996; Schneider, 1996). Student perceptions, according to Schunk (1992), represent "complex processes that are influenced by a variety of factors and that have diverse effects in school" (p. 4). Student perceptions are typically assessed through questionnaires (surveys) or interviews in which students are presented various items asking about their beliefs and how they judge each item on a numerical scale (Ericsson & Simon, 1980; Frankel & Wallen, 2003; Gall, Gall, & Borg, 2003; Nisbett & Wilson, 1977). The method of data collection in this study included a questionnaire in survey form, as well as one-on-one interviews with randomly selected teachers and students, alike. This provided the researcher with a sample to represent the population to which the findings of the data analysis could be generalised.

Researchers have investigated student perceptions to determine their relation to teaching and student behaviours (Brophy & Good, 1986). Historically, however, the study of student perceptions has received very little research attention. A great deal of interest in student perceptions surged simultaneously with the gradual diminish in the dominance of behavioural psychology. At present, it is not uncommon for educational researchers to seek the perceptions of teachers; however, the impetus to consider possible comparisons between student perceptions with that of their respective science teachers' has been insufficient. More specifically, researchers studying the effects of students' perceptions, and whether a variance exist with that of their teachers' impact achievement, are almost nonexistent.

Only recently have school reformers invested much time and attention in examining the perceptions of students about learning. The standards movement has, in fact, dominated the research scene for nearly a decade now, moving the present educational tide from that of a "child-centred" educational approach to a "standards-centred" educational approach. Apart from the political aspirations of some, most

people genuinely want students to learn. Jackson and Davis (2000) suggested that, "[i]mprovement in student achievement across all groups requires a relentless focus on the heart of schooling—that is, on teaching and learning" (p. 31). Many suggestions have been made by educators and researchers, alike, as to how to improve student achievement. Some theorists have proposed research results in how to apply "brain-based" strategies in the classroom (McGeehan, 2001; Pool, 1997; Rosenfield, 2002; Sylwester, 1997). Others have proposed improving learning via the endorsement of professional development schools (Wise & Levine, 2002). Some researchers have advised more rigorous teacher training programs and more course work (Wise, 1999; *Summary Data*, n.d.), or even the requirement for a master's degrees as a means of the renewal of one's teaching certification (*Teacher Education*, 1999). Some of the educational reformers have proposed more standardised student-testing as a means of teacher evaluation and accountability (Archer, 2002). In other words, teacher accountability is perceived as judging a teacher's competency by how well his or her students score on some specific standardised test. Nair (2002) approached learning reform from an entirely different angle by holding that school buildings should be redesigned for effective teaching and learning as based on research findings. Day (2002) posited that changing the approach and perception of teaching to that of a "non-standard classroom" would facilitate learning. He proposed such conceptional changes as cooperative and authentic learning (Day, 2002). Several researchers have even suggested a form of homogenising schools by segregating student populations according to socio-economic status, or some other form of composition (Burns & Mason, 2002; Kahlenberg, 2001).

Many science educators, however, are recommending that the learning experience can be improved by focusing more on the teacher-student relationships, and more distinctively, the learning environment (Fisher, Rickards & Fraser, 1996; Rickards, 1998; Schunk, 1995; Wubbels, 1993). Isbell (1999) studied student perceptions with the evaluation of web-based learning, while other researchers have sought to examine the evaluation of classroom goals and maladaptive behaviours using student perceptions (Friedel, Marachi, & Midgley, 2002; Nair, 1999). Barman, Ostlund, Gatto, and Halferty (1997), as well as Barman (1999) sought to determine student

perceptions regarding scientists and how they study and use science, while Neathery (1997) studied student perceptions towards science as a course.

Student achievement and teacher-student relationships

Student achievement is unquestionably in the forefront in this era of standards and accountability, but achievement is typically, at least in practice, measured using standardised tests (Amrein & Berliner, 2002; Basterra, 1999; Behuniak, 2002; Brown, n.d., Dorn, 2003; Haydel & Roeser, 2002; Newell, 2002; Stiggins, 2002; Wellstone, 2000; Wiggins, 1998). The use of standardised tests to measure student achievement are questionable (Bassett, 2002; Zwick, 2002). Consistent with Hamel and Hamel (2003), Glass (2003), Stiggins (2002), Amrein and Berliner (2002a, 2000b), and Winter (2002) the present practice of trying to determine student learning by way of standardised testing actually debilitates many students. Glass (2003) therefore, has called for a re-examination of assessment with a great emphasis on formative classroom assessment and how assessment might improve student learning. Test scores, alone, leave people on the far-end of "high tech" as opposed to "high touch" (Naisbitt, 1999). This terminology is used by marketing magnates to express the continuum of very personal to very impersonal, cold and formal. Middle level students undeniably need and crave the warmth and informality of a "high touch" approach to teaching and learning. The contrast here is that of impersonal versus personal. This study has sought to determine whether the student-teacher concept of teaching and learning has an influence on student achievement.

Research indicates that student perceptions can mediate the relationship of teacher behaviours to student achievement, thus reinforcing the notion that teaching can influence student perceptions, which in turn affects achievement (Schunk, 1992). That students' perceptions can affect classroom events is also true. Rotters (1966) in regards to student motivation introduced the concept of *locus of control* in which he emphasised *perceived control* over achievement and outcomes. In relationship to the current study, one might see how a student's perception has a great deal of influence on whether the student perceives the ability to succeed or fail academically. This study was significant, in that it attempted to extrapolate whether large differences between a students' perceptions of learning occurs when compared with that of their

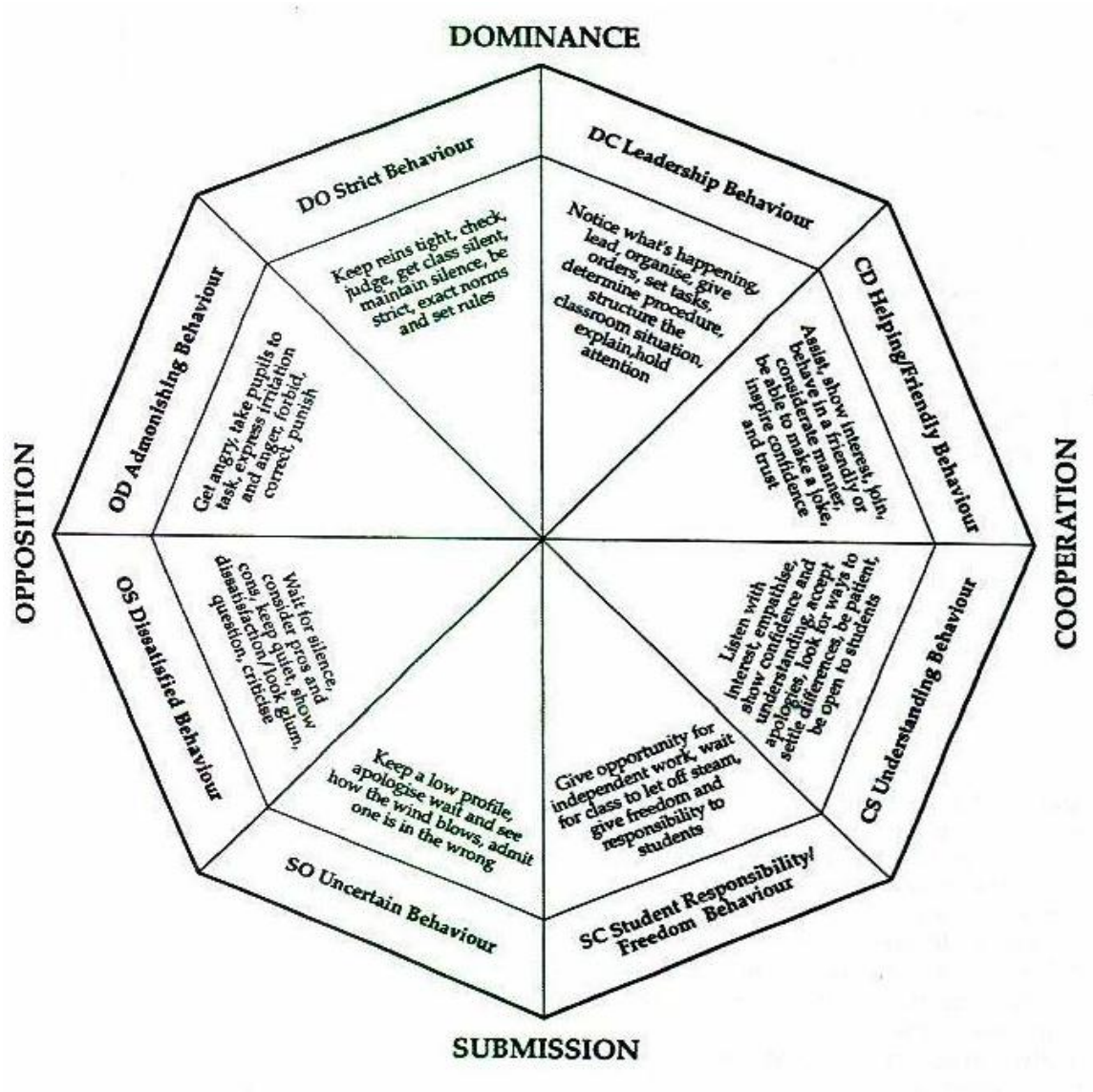
respective science teacher's perception. The difference was then compared to the students' academic success.

Research on Interpersonal Teaching Behaviour

Interpersonal teaching behaviours are evaluated by having students record their perceptions regarding the teacher. These teacher practices/attitudes can be analysed in various ways. Daniel and Blount (1992) produced a middle school descriptive survey similar to the QTI which acted as a quantitative instrument for measuring organisational *culture* in middle schools. Fisher and Rickards (1996) studied relationships between teacher and student interpersonal behaviour and their effects upon student attitudes in mathematics classes using the QTI. A similar study, also utilising the QTI, was conducted that same year by Fisher, Rickards, and Fraser (1996) in assessing teacher-student interpersonal relationships in science classes. Their findings indicated a strong correlation for each dimension studied (Fisher, Rickards, & Fraser, 1996).

The theoretical basis for the QTI was founded on the systems perspective of Leary (Leary, 1957; Wubbels, Créton, & Holvast, 1998), namely, the assumption that behaviour of participants influences each other interactively and mutually. Thus, the behaviour of the teacher is influenced by the behaviour of the students, which in turn, then influences student behaviour. Leary proposed to map interpersonal behaviour by producing a two-dimensional dichotomy. The first dimension Leary labelled *Influence*, which he believed to be made up of a continuum from Dominance, (D) to Submission, (S). The second dimension Leary called, *proximity* dimension, and was made up of a continuum of Cooperation, (C) to Opposition, (O). In visual form (see Figure 2.1) these two dimensions are presented in a coordinate system divided into eight equal sectors (Wubbels, Creton, Levy & Hooymayers, 1993, p. 16).

Figure 2.1. Diagram of the eight sectors within the four dimensions being examined using the Questionnaire on Teacher Interaction (QTI)



The areas within the Submission/Dominant dimension include leadership, understanding, uncertainty, and admonishing. The areas within the Cooperation/Competition dimension include helpful/friendly, student responsibility, dissatisfied, admonishing, and strict (Wubbels, 1993).

Research about Student Perceptions of Learning and Student Achievement

A number of studies have sought to determine associations between perceptions and student achievement. One early study, conducted by Stayrook, Corno, and Winne, (1978) found that teacher behaviour positively influenced student perceptions and that student perceptions positively influenced student achievement. Wigfield and Harold (1992) noted that "it is not just what teachers do but how students view teachers' behaviour that relate both to students' own sense of efficacy and their school performance" (p. 98). Weinstein (1989) proposed a student mediational view of student achievement, stating that, "[i]t is the students' perception—cognition that is ultimately the influential element on achievement" (p. 192). Schunk (1992), however, maintains that student perceptions can mediate the relationship of teacher behaviours to student achievement. This becomes an interactive model in which the teaching influences the students' perceptions, which in turn, affect achievement.

According to Nias (1981), the way in which a teacher interacts with students is not only a predictor of student achievement, but also it is related to such factors as teacher job satisfaction and teacher burnout. Wubbels (1993) found a positive correlation between student achievement and noted teacher characteristics such as strict behaviour, leadership behaviour and friendly behaviour. Though the social background of students appear to have a play on achievement (Steinberg, 1996; Traub, 2000), it has become apparent that teachers with specific characteristics (teacher-inputs), practices, training, or ability to foster higher-level orders of thinking, do in fact make a difference in the classroom or at least equal influence as students' background (Goldhaber & Brewer, 1995; Monk, 1994). Wenglinsky (2003) proposed that "decisions that teachers make about classroom practices can either greatly facilitate student learning or serve as an obstacle to it (p. 5).

Likewise, Rickards and Fisher (1996) calculated the effects of teacher interpersonal relationships with student outcomes. They surveyed science and mathematics students in Western Australia and Tasmania using the QTI. One component of their study was to ascertain the interpersonal relationship between teacher behaviour and student attitudes and achievement. They were able to establish a significant ($p< 0.5$) correlation between student attitude and teacher behaviour. Simple correlation (r)

figures indicated student attitudes on all scales of the QTI were statistically significant. The data, however, when analysed for cognitive outcomes, were not as strong or as convincing. Rickards and Fisher's (1996) findings concurred that, "[c]ognitive achievement was higher where the teachers demonstrated more leadership, helpful/friendly and understanding behaviours and less strict, dissatisfied and admonishing behaviours" (n.p.). It appears that the "Dissatisfied" scale was negatively associated with cognitive achievement. The study, however, does not appear to specify how cognitive achievement was defined or measured.

The research questions noted in Chapter One are bound by issues such as student perceptions, teacher perceptions, the concept of middle level education, the issue of out-of-field teachers, as well as science in the middle school. These will be discussed in the following sections.

Why science classes were chosen

Science classes were chosen for several reasons for the focus of this study. Firstly, science educators have led the way for many years in their work in the improvement of teaching and learning. Secondly, while the demand for improved academic achievement in science has been strong, educational statistics have been disappointing. In particular, the Southern Regional Education Board (1999) reported that grades five through eight are the vulnerable linkage in American education with Southern states performing more poorly in science than students in the rest of the nation, even when the effects of poverty and minority status are taken into account. Additionally, gender and race differences in science achievement and motivation have been documented by several researchers such as Atwater, Wiggins, and Gardner (1995), Greenfield (1996), and Rech and Stevens (1996). Some findings have attributed the differential performance and motivation of groups to characteristics of the classroom and school environment demonstrating that even one year with an ineffective teacher can have a lasting impact on students' academic outcomes (Eccles, Midgley, Wigfield, et al., 1993).

Teacher perceptions

There have been, in general, more studies conducted on teacher perceptions than on student perceptions, such as the study by Ross, Hannay, and Hogaboam-Gray (2001) which examined teacher perceptions on the impact of school reform on student achievement or that by Brown (n.d.) regarding learning and block scheduling. Most studies typically seek teacher perceptions apart from that of students such as studies which have sought teachers' perceptions on students' abilities, interest, and the value they attach to a task. Research has shown that teacher's perceptions do have an effect on student perceptions (Brophy & Good, 1974).

Wigfield and Harold (1992) found that student perceptions of their ability decrease across the elementary school years. A few researchers have sought the perceptions of *both* teacher and student. Altar (2001), for example, selected to determine student and teacher perceptions in high school chemistry courses in microcomputer-based laboratories. Akerson and Flick (1999) sought teacher and student viewpoints on recognising the importance of student ideas in elementary science. Although there is little on student perceptions, the bulk of research addressing this concept centres at the tertiary level; such as that used in traditional instructor evaluations completed by students. Little has been done in the area of student perceptions of effective teaching and learning, though a few studies have addressed this concept at the university level (Center, 2000; Nair, 1999), and another (Harrison, Fisher, & Henderson, 1997) having done so at the high school level. Even fewer studies can be found in the area of middle level education.

In 1998, Rickards and Fisher conducted a study in which they surveyed 3,515 students in 164 schools in Western Australia, utilising the Questionnaire on Teacher Interaction (TQI) to compare student and teacher perceptions of the teacher-student interaction within middle school classrooms of science and mathematics. The significance of this study was that teacher interactions did have an effect on students, and how students perceived teacher-student interactions were not usually the way the teacher perceived such interactions themselves. In truth, teachers' perceptions can be very different from that of the students' (Ares & Gorrell, 2002; D'Arcangelo, 2000; Duit, Treagust & Mansfield, 1996). Fraser (1986) determined that students viewed

classrooms much more negatively than their teachers. Modern-day educational reform centres on programs of academic standards as opposed to classroom-based interactions between a teacher and the student. There is a need to reverse the trend and begin to focus more on classroom-based interactions which greatly influences effective teaching and learning. Middle level science education has much to gain from such a focus.

Middle level education

Since endorsed practices considered essential to the middle school model of schooling (such as teaming, exploratory courses, co-curricular programs, adviser-advisee arrangements, and intramural activities), are not consistent in middle level schools, as many junior highs contain middle school components and vice versa (NMSA, n.d.), this study simply addressed all school from grades 5-9 as inclusively "middle grade", "middle school" and "middle level". These terms were used synonymously in this study and were defined as student placement in grades 5-9, which typically occurs in the United States between 10 and 15 years of age. Under the influence of such developmental learning theorists as Piaget (1929), Vygotsky (1962), Maslow (1954), Erickson (1968), Kohlberg (1980), and Bruner (1987; 1973) came the impetus for the emergence of the concept known as constructivism. These same scholars impacted the middle school movement which hold that this age of development is an important transitional period due to the students' particular developmental needs (Burns, 2002; Ferguson, 1998; Jackson & Davis, 2000; Meece, 2002; Olson, 2002; Fraser, 1997). With middle school being a transitional stage causes this period of schooling to be critical, and pivotal, for future success at the traditional high school level, and arguably, adulthood (Delisio, 2002; Ferguson, 1998; *Supporting Students*, 1992).

The report by the Carnegie Council on Adolescent Development's Task Force on Education of Young Adolescents entitled, *Turning Points: Preparing American youth for the 21st Century* (Reforming, 1990), proposed that middle level students need a "…movement to support and educate young adolescents during a formative period of dramatic biological, cognitive and psychosocial changes, increase

vulnerability, potential risk and special opportunities" (p. 2). This report stated that one in four adolescent students was in danger of being at-risk, another one in four of becoming at-risk, and another one-forth being at moderate-risk. In practical terms, this means that nearly seventy-five percent of American adolescents now may be in some way "at-risk", and this population includes middle grade students. The Steinberg study, which sampled nearly 12,000 students in grades 7-12, concluded that between 7th and 9th grade a large percentage of students become detached and disengaged from school (Olson, 2002). These results are significant in that those students dropping out by grade 9 were not included in the survey. The Carnegie Task Force makes a very strong statement that the "…middle grade schools are potentially society's most powerful force to recapture millions of youth adrift, all too often these schools exacerbate the problems of young adolescents" (Reforming, 1990, p. 2). The post-Carnegie middle schools were distinguishably different from their predecessors (*The Sum*, 1994). Middle schools have sought to become "student-friendly" by creating developmentally responsive schools that appropriately meet the developmental needs of pre-adolescent learners with developmentally appropriate curriculum and instruction (Burns, 2002; Kramer, 1992; Manning, 2002; Petzko, Clark, Valentine, et al. 2002; Schriver & Czerniak, 1999).

Why examine middle grades? There is considerable evidence suggesting a tremendous decline in student motivation and achievement for those moving from elementary to middle school (Anderman & Midgley, 1998; Bishop, 1989; Daniels, Kalkman, & McCombs, 2001; Eccles, Midgley, Wigfield, 1993; Ferguson, Forbes, 1996, 1998; Kramer, 1992; Maeroff, 1982, 1996; Robison, 2001; Thomason & Thompson, 1992). One must stop to contemplate why this is so. Could it be a normal aspect of the transition? Could this be a result of developmental change? Or, might this be a result of cause and effect? Marchant, Paulson, and Rothlisberg (2001) found that student' perceptions are predictors of academic achievement. Eccles, Midgley, Wigfield, et al. (1993) noted that middle level education has a greater emphasis on teacher control and discipline as well as with fewer opportunities for choice and self-management. This team of researchers hypothesized that these practices were less developmentally appropriate and were in conflict with the adolescents' identity development and quest for autonomy. When this is viewed with teacher-parent relationships becoming more negative and impersonal, ability grouping, public

evaluation of work, and grading systems that are normative-based, motivation and excitement about schooling wanes. Though such changes would be detrimental at any age, they may be particularly injurious for adolescents. Adolescence is characterised by a peer orientation and increased self-consciousness, such that the changes which have been noted in adolescent classrooms do not provide a good stage-environment fit. Characteristics of the classroom environment coupled with developmental characteristics of early adolescents increase the risk of negative motivational outcomes especially for low achievers (Eccles, Midgley, Wigfield, et al., 1993). In analysing these discrepancies of "fit", some educators (Dunn & Dunn, 1979; Eccles, Midgley, Wigfield, et al., 1993) have found that self-report measures indicated that factors such as increased ability grouping, whole-class instruction, and social comparison of grades, all factors likely to promote student competition, were also factors associated with declines in student motivation. The assumption that the motivational decline is a consequence of the students' developmental stage is discounted by Eccles, Midgley, Wigfield, et al., (1993) as more of a result of the mismatch between students' needs and the classroom environment. Dunn and Dunn (1979) made a similar conclusion over a decade prior to this study that schools attempt to mould student to fit the system than to mould the system to fit the student. Strobino, Gravitz, and Liddle (2002) came to conclusions that a lack of environmental fit existed by determining student perceptions regarding the school's system of assessment. Caporrimo (2001) advocated that student perceptions are rarely considered in educational research. She stated, "I am amazed at how often we struggle to design research that 'gets at' issues involving teaching and learning without considering the student's perspective (Caporrimo, 2001, p. 5). Could this lack of taking notice of student perceptions account for the lack of "fit" reported by some researchers? The problem may lie in the way educators traditionally consider classroom environment. Eccles, Midgley, Wigfield, et al. (1993) noted that classroom environments are not fixed entities, but rather are dynamic. Classroom environments, however, characteristically and typically, remain stable throughout the high school years but continue to have a negative effect on student motivation (Eccles, Midgley, Wigfield, et al., 1993).

Since student motivation, academic success, and classroom environment are so intertwined, the concept of student perceptions of learning is vital. Therefore, the

rationale for this study was to consider the classroom environment by determining students' perceptions of effective teaching and learning in *comparison* to their respective science teachers' perception of effective teaching and learning. This study added to the research based by examining students' perceptions of learning and teaching strategies, and compares them with their respective science teacher, in order to determine the effect the difference of perceptions might have on student academic achievement. With differences and similarities between a student's and teacher's perception identified, it is then possible to examine student achievement and determine if any association exists between achievement (i.e., grades), and the differences in students and teachers' perceptions.

This leads us to a very important question. Are middle grade students mature and experienced enough to provide vital feedback on what they consider effective teaching and learning might be? According to Ares and Gorrell (2002), middle level students are quite capable. In their study they concluded that "[t]hese students' perceptions provide concrete, substantive, and sophisticated corroboration for research on effective teaching practices" (p. 263). Ares and Gorrell (2002) discussed their surprise at the "depth of awareness and the analysis the students shared with us" (p. 263). D'Arcangelo (2000) contended that students "have their own framework for looking at things, and they interpret the world through the filters of their cognitive structures" (p. 8). Stability in student self-reports occurs around ages 9 to 10 (Schunk, 1992) well before the middle school years. Muth and Alvermann (1999) maintained that young adolescents are valuable "stakeholders" and therefore, their "voices are worth listening to" (p. 276).

"Students' experiences", according to Ares and Gorrell (2002), "are very different from teachers' and that teachers often don't understand or fully appreciate those experiences" (p. 264). It is conceivable then, that students enter the school year with very different experiences, expectations, skills, and concepts as that of their teacher. The teacher provides the student with a sense of structure and expectation and sets out during the year to provide opportunities for students to gain necessary skills.

The issue of out-of-field teachers

The task of educating pre-adolescents is a difficult one, but to complicate matters even more so, Gewertz (2002) reported that 50 percent of middle school students are under the tutelage of teachers who *lack the training* or certification to teach middle school. These teachers are considered by their respective State Departments of Education as out-of-field (Seastrom, Gruber, Henke, McGrath, & Cohen 2002) meaning they are not certified in the area in which they teach. What concept of effective teaching and learning would one have that is out-of-field compared to one who is in their trained field? Does this affect teacher quality? Some researchers think it does (Ravitch, 1998; *Teacher Quality*, 2002)? What about differences in expectations? Knowing that expectations affect student achievement (Bamberg, 1994; Lumsden, 1997; Wasserstein, 1995), such conditions made this study relevant, and even vital, to understanding some of the unseen influences and interactions that occur within a science class between students and teachers. What about differences in their perceptions of teaching and learning? These are vital questions to ask in an era in which even the United States government is bashing Schools of Education (Darling-Hammond & Youngs, 2002; U. S. Department of Education, 2002).

The debate of in-field versus out-of-field will continue to brew until answers are provided about how these two classifications affect student achievement. Byrnes (2001) noted that "meaningful perception" is very different for the expert and novice (p. 78). An expert sees a meaningful whole whereas novice tends to see a collection of separate components. Conceivably, a teacher out-of-field will have a very different perception of effective teaching and learning in a course for which they are not trained as opposed to one being trained (Berliner, 1990; Borg & Ascione, 1982; Stallings, Needles, & Stayrook, 1979; Wenglinsky, 2003). These studies raise a serious issue regarding the practice of using out-of-field teachers. Does it mean that students experiencing the tutelage of an *out-of-field* teacher have an even greater variance in their perceptions of effective teaching and learning than that of their out-of-field teacher?

This topic of out-of-field teachers has produced a vast amount of fervour in the media the last few years (Berliner, 2000). There has been, and continues to be, a

great amount of debating in the United States over teacher credentialing. This was relevant to this study since training has a huge influence on a teacher's perception (*Summary Data*, 1999). The practice of using out-of-field teachers has come to the forefront (Archer, 1999; Ingersoll, 1999; Jerald, 2002; *Many Middle*, 2002; Starr, 2002; *Summary Data*, 1999) and is a growing issue as standards and accountability issues continue to seethe. There are various gradations of being out-of-field. Most of this concern stems from the fact that often teachers graduate from nationally accredited teaching programs but are then shifted, or transferred, into areas of the school academic program where they have little or no training. These teachers are referred to as out-of-field (Jerald, 2002; Seastrom, Gruber, Henke, et al., 2002; *Summary Data*, 2000). They could be, for instance, masterful teacher in Language Arts but find themselves being put into a situation where they may teach mathematics some part of the day. Or, often, the well-qualified mathematics teachers may have a few courses in science; therefore, he or she is now expected to teach a few courses of science. Or, a qualified teacher is totally removed from their area of expertise and placed out-of-field due to a shortage of teaching faculty. That itself should raise concern. There is, however, a worse scenario where one walks in from off the streets unprepared or untrained, and yet, is expected to teach.

In a study conducted by the United States Department of Education (Seastrom, Gruber, Henke, 2002) over 50,000 interview surveys were completed by teachers representing all fifty states, of which 80 percent were from public education. With a 75 percent return rate, Seastrom, Gruber and Henke (2002) found that in the middle grades sciences, 30 to 40 percent of students were being taught by teachers who lacked the proper credentials. Some divisions of science, such as physical science, had as high as 56 percent of students having teachers who were not qualified (Seastrom, Gruber, Henke, 2002). This percentage is much higher for schools in poor socio-economic situations. For example, the State of Ohio ranks 11th in the United States in the use of out-of-field teachers. Jerald (2002) reported that in total Ohio uses 33 percent of out-of-field teachers. A disparity, however, is recognised when the total out-of-field teachers are compared by district and by socio-economic status. In practice 26 percent of Ohio's schools use out-of-field teachers, but, in high poverty schools this figure escalates to 42 percent (Jerald, 2002). In other words, Ohio public

schools use twice as many out-of-field teachers in areas of high poverty than in areas of lower poverty.

The National Council for Accreditation of Teacher Education (NCATE) testified regarding this increase in the use of unqualified teachers.

> "In recent years, more than 50,000 people who lack the preparation required for their jobs have entered teaching annually on emergency or substandard licenses. In any such instances, the person is considered out-of-field for they do not have proper credentialing in the subject area" (*Summary Data*, 2000, n.p.).

NCATE also has declared,

> "Recently, 27 percent of newly hired teachers have not been fully licensed (U. S. Department of Education, NCTAF). 12.5 percent had no license, and 14.9 percent were hired on temporary, provisional, or emergency licenses" (*Summary Data*, 2000, n.p.).

One can only wonder why a school district would hire someone who is not prepared to be a teacher. Some may even speculate that this is a rather forgone and rare practice and that the exceptions are being blown out of proportion. Unfortunately, this does not seem to be the case.

Though this study was not centred on the issue of out-of-field teachers, this issue may prove to be of vital importance in the application of the results from this study. If the perception of an expert, for example, credentialed in science is very different from that of a novice, then the effect on student learning and achievement becomes a serious concern for the school, the principal, and the parents, not to mention those students in transitional stages of development. And, if the perception of a teacher is not dependent upon being in or out of their field of training, then possibly there is an overreaction taking place regarding the out-of-field status of teachers.

Science in the middle grades

Tobin (1994) and colleagues proposed a need for further research in the area of teacher beliefs and perceptions regarding science education reform in order to ensure reform success. Duit, Treagust, and Fraser (1996) reported the importance of conceptualising student insights in science instruction provided by the examination of "students' ways of thinking and understanding in science and mathematics" (p. 17). Schriver and Czerniak (1999) sought to determine the perceptions and beliefs of science teachers in order to establish the impact of teacher efficacy on science instruction. Perceptions, in and of themselves, are neither positive, negative, right or wrong, for they are personal and perceived as truth and reality by the one perceiving. If a teacher, for example, perceived that his or her students were learning from his or her class, then that teacher would confidently progress through teaching the topics as planned. If, however, his or her students did not perceive that *they* were learning, then the daily lesson may only be a blur to them. The students' perception is very different from the teacher's, and, as a result, the students' academic achievement suffers. Schriver and Czerniak (1999, p. 22) noted that the important concept here is that, "teachers' beliefs are associated with their efforts to teach all students" (p. 22). This view concurred with that of Tobin (1990). Darling-Hammond (2000) proposed that teachers probably have more influence over student learning than any other factor including the students' family characteristics or ethnicity. *All students* is the precise phrase being used by the federal mandate to which each State will be held accountable by the United States Department of Education (*No Child*, n.d.). According to many researchers, there is a significant association between a science teacher's expectations and beliefs about his or her teaching effectiveness and that of student motivation and achievement (Schriver & Czerniak, 1999; Thomason & Thompson, 1992). Conversely, Schmuck (1982), Goldberg (1995) and Weasmer and Woods (1998) found that in middle schools where teachers had high levels of self-efficacy were students who also possessed positive self-efficacy beliefs. Teacher perceptions establish teacher self-efficacy (Ross, 1995) an important element influencing student success or failure in the classroom.

Defining Effective Teaching and Learning

Effective teaching is defined as strategies and actions which motivate and help students to learn. This has not sought to collect a list of "effective" strategies, but has assumed that if the student learns then the effectiveness is present. This study has sought, however, to ascertain how students perceive effective teaching and learning in a science class environment. The instrument used to ascertain these data was the QTI. The originators of this survey have pointed out that the factors being considered are, for the purpose of evaluation, the students' perceptions of their learning environment. There are many aspects, however, within this concept called "learning environment". It is imperative that a definition be provided that will explicate the interrelatedness of effective teaching and learning, with that of academic achievement.

Classroom environment is defined by Haertel, Walberg, and Haertel (1981) as the associations which interplay among the students' cognitive and affective learning outcomes in a classroom. This has been used to mean not just what a teacher does, but also how a teacher manages. In the study, these two categories were viewed in the simplest of meanings as teacher "dispositions", simply because Katz (1995) has defined these "to distinguish trends in behaviour from skills, attitudes, traits, and mindless habits, and that these distinctions have useful, practical implications even in the absence of desirable precision" (n.p.). For clarification purposes, it was assumed in this study that what a teacher displays, in either attitude or strategy, will have an effect on students, and how a teacher displays these, is an indication of what a teacher believes about effective teaching and learning, at least in practice. Ngoh (1997) concurred with this definition. Dispositions, according to Tishman, Jay, and Perkins (1992), are abilities, sensitivities, and inclinations. In relation to the QTI, for example, items typically query teacher actions, such as item 13, which stated, "This teacher knows everything that goes on in the classroom". Item 25 reads, "This teacher helps us with our work". These questions, when answered, will provide the researcher with an accurate estimate of what that teacher (or student) believes to be effective teaching and learning. With this close association between learning environments and effective learning and teaching viewpoints, using the QTI to ascertain this information was justifiable. Thus, the uniqueness of this study is the

investigation to determine if a teacher's concept of effective teaching and learning has an effect on the student's achievement, based on the teacher, as well as the students' concept of effective teaching and learning. Stayrook, Corno, and Winne (1978) sought to determine the influences on student achievement by way of path analysis. Using this model, the researchers were able to determine a relationship between teacher behaviour and student perceptions.

Chapter Summary

The second chapter summarized the literature relating to student perceptions and student cognitive achievement, particularly in the middle level grades. A brief history of survey research that sought student perceptions from the 1970s to the present was presented. It was shown how listening to students and their perceptions were an integral part of the school reforms of the last twenty years. Examples were provided of studies that sought to improve learning environments by way of survey instruments, such as the Learning Environment Inventory (LEI) and the Questionnaire of Teacher Interaction (QTI). A brief introduction to the QTI provided an explanation of how the survey presented a means of classifying responses provided by teachers and students. Issues embedded in the context of student perceptions, teacher perceptions, middle school science education, and out-of-field teachers, were examined in light of the study. This chapter concluded with the defining of effective teaching and learning.

In spite of all of the literature reviewed, no study has previously been completed that seeks to compare the perceptions of middle school students with their respective science teacher and to consider any effect this may have on the students' achievement. This distinction, will therefore, build on the firm foundation of all the previous work done in the area of student-teacher perceptions and classroom learning environments. The next chapter outlines the methodology for the study, including the research design, an historical perspective on the Questionnaire of Teacher Interaction (QTI), research questions, instrument selection, and the validity and reliability of the QTI. Descriptions of the data collection and analysis, as well as an examination of ethical issues and limitations of the study, are provided.

CHAPTER 3

METHODOLOGY

Introduction

The previous chapter provided a review of the literature and indicated the theoretical basis upon which research studies into student perceptions of learning environments, and interpersonal behaviour have been based. The aim of the study was to gain an understanding of the interpersonal perceptions that occurs between a teacher and the students and whether this influences student achievement. This study expanded the initial work begun in the 1997 study (NeSmith, 1997) *How Middle Level Students Perceive Effective Teaching and Learning*, which concluded that middle grade students do have a clear and reasonable perception of what effective teaching and learning is, as well as, revealing that middle grade students expressed confusion between the dichotomy of "freedom" versus "responsibility"; possibly a result of age-related and developmental processes.

In this chapter the research design of the study is described along with the details of procedures to conduct the study. This required participant selection choice of instrument, and data collection and handling. A brief review of the theoretical framework in the study, which was to ascertain the perceptions of middle grade level students of their classroom environment, as well as the rationale used in comparing student-teacher perceptions with that of student achievement, is provided. The methodological framework underpinning the study also is outlined.

The Research Design and Research Questions

Theoretical framework

The teacher-student interpersonal relationship extends beyond the science class to that of the soccer field and even beyond the school community, this study, however focused on interpersonal interactions between teachers and students during a single school academic year in a single day of a typical science class. Rather than focusing on individual teachers and individual students, this study has sought to focus on, and

to examine, whole class interactions and how these are perceived. The study was conducted with middle school science teachers during regular class time and after a minimum settling period of seven to ten weeks of teacher-student interaction. This study sought to extend previous research by examining the nature of the relationship of teacher-student interpersonal behaviour with student attitude and achievement in middle school classrooms, as well as to identify differences in perceptions and whether the perceptions have a notable effect on student achievement.

The development of the Questionnaire on Teacher Interaction (QTI)

Here an historical perspective on learning environment instrument development is described, with the greater emphasis being placed on the origin of the Questionnaire of Teacher Interaction (QTI). Many educational studies of the 1950s and 1960s began to ascertain the social-behavioural associations in classrooms through experimental research. The instruments that have been used in studies of student perceptions in the past also tended to be those that considered learning environments (Fraser, 1998a, 1998b, 1998c, 1998d; Moos, 1979; Walberg, 1968; Wubbels, 1993). The instruments used were a survey format and were typically scored on a five-point numeric Likert scale (Likert, 1932). Classroom environment questionnaires have multiple uses, even that of evaluating "participator learning" (Forster, 1999). Some of these early pioneering studies, like Moos', centred on the environment of mental hospitals or institutions of incarceration (Moos, 1968, 1972). Of particular interest for this study was the approach taken by Walberg and Anderson in developing, trialling and validating the Learning Environment Inventory (LEI) (Wubbels, Créton, & Hooymayers, 1985). The LEI became the "model" for perfecting, refining, and improving better psychosocial instruments ascertaining learning environments. Such inventories as the Classroom Environment Scale by Moos and Trickett (1974), the Treatment Perception Scale (TPS), the My Class Inventory (MCI) by Fisher and Fraser (1981), and the Individualised Classroom Environment Questionnaire by Fraser (1990e) were utilised to quantify data gained from students regarding classroom environments for the purpose of analysis. The Questionnaire of Teacher Interaction (QTI) by Wubbels and Levy (1993) soon followed. The American version of the QTI was produced some two years later (Wubbels & Levy, 1991), and

the Australian version (see Appendix D) was established in 1993 (Fisher, Fraser, & Wubbels, 1993).

The Australian version of the QTI was, however, more time-economical than its counterpart, with 48 items utilising a five-point response scale (Fisher & Rickard, 1996). This made the QTI more functional for classroom teachers to use with their students for it was less time-consuming to administer and score. Nevertheless, all three versions of the QTI have shown to be valid and reliable instruments. The Australian version of the QTI has been made available for mathematics and science teachers for use in their own classrooms. This version was chosen for the current study because of the economy and time factor, as well as for its verification of being both valid and reliable.

Methodological framework

In keeping with recent trends in the research on classroom learning environment, this study utilised both qualitative and quantitative methods (Fisher & Fraser, 1990; Fraser & Tobin, 1991; Fraser, 1998a; Fraser, 1998b; Fraser, 1994c; Fisher, Rickards, & Fraser, 1996). According to Tobin and Fraser (1998), combining qualitative and quantitative methods of research provides multiple theoretical perspectives (observational and interpretive methods) into education in general, and the classroom, in particular. The practice of including a combination of both quantitative and qualitative measures is generally accepted as enhancing the study (Fraser & Tobin, 1991; Tobin & Fraser, 1998). The instrument used in this study was the Questionnaire on Teacher Interaction (QTI). According to Jaeger (1988), the purpose of the sample survey method is "to describe specific characteristics of a large group of persons, objects, or institutions" (p. 459).

Another unique aspect to this study is that the classroom science teachers were also surveyed along side the students during the same period of time. Fraser and Wubbels (1995) noted that numerous programs have shown that the student's perception of their classroom environment may account more for academic success than that of their background. Gentile (1997) found that improved teacher perceptions of school climate and morale had an important impact on the achievement level of middle

schoolers in the areas of reading scores and mathematics scores, and thus, in the achievement levels of middle school children, in general. Another distinction of this study is that it was centred on middle grade level science students with their respective science teachers. The study involved students in grades 5 through 9 science classes.

Research hypothesis and research questions

As stated in Chapter One, the research design for the study was guided by a research hypothesis and three research questions. The hypothesis was that if student perceptions, in comparison with teacher perceptions, provide a means of predicting student academic achievement, then the use of inventories soliciting such information would prove advantageous in improving learning and teaching in science classrooms. A more precise statement of the hypothesis was:

> Student achievement, according to the students' six or nine week grade report, will reflect correlational relationship with that of their respective teacher's perception.

Three specific research questions were derived to test this hypothesis.

1. What are students' and teachers' perceptions about effective teaching and learning?

This research question stemmed from the previous study mentioned which sought to determine how student perceive effective teaching and learning (NeSmith, 1997). In a modified form, it is now being used in this study to generate a means of comparison between students' perception with teachers' perception.

2. In what major ways, if any, do students' perceptions and teachers' perceptions differ?

The rationale for this research question stemmed from studies attempting to question possible associations between student perceptions of teacher-student interpersonal

behaviour. If there are differences, then, what are some of the differences found in surveying middle school science teachers and their students?

3. In what ways do differences in student perceptions and teacher perceptions of effective teaching and learning have a significant effect on student achievement?

The rationale for this research question is a result of seeking relevant application to what consequences might result from a large disparity between a teacher's perception of effective teaching and learning with that of student achievement. This conjures up questions such as, is there a relationship between achievement and the differences between two perceptions?

Phases in the research design

The research design procedures required participant selection, instrument choices, and data collection and handling which were conducted over four phases.

Phase 1 Identification of instruments, cooperating schools, cooperating teachers, and their students.

Phase 2 Survey teachers and students using the QTI and analysing the data.

Phase 3 Interviews with teachers and students to clarify questionnaire results.

Phase 4 Collecting student achievement scores, as provided by each respective teacher for each participating student, based on their most recent grading period for comparative purposes.

The chapter now looks at each of these phases in detail in order to examine how the course of the study developed. The descriptive data, how the data were analysed, as well as, how conclusions were drawn, will be discussed more fully in Chapter Four.

Phase 1: Identification of Research Instruments, Cooperating Schools, Teachers, and Students

Identification of the research instruments

The research design in the study was based upon the survey method to allow for various means of obtaining the perceptions of others, in order to be compared and contrasted. Because of time restraints, the size of the sample, and the number of variables being relatively small, the survey method was chosen as the most efficient and the least cumbersome research method to adopt (Crowl, 1996). The survey approach was bifurcated. First, the Questionnaire on Teacher Interaction (QTI), developed by Wubbels and Levy (1993), was used followed by some student and teacher interviews to strengthen the validity of the results in the study. The protocols for the interviews were based on revisional questions directly linked to the QTI (see Appendix D and Appendix E). For example, where the QTI inquired about helpful or strictness then the interview protocol posed a similar semi open-ended question. For example, "Would you say that your teacher helps students behave more by making strict rules or by encouraging students to do what is right? Why do you think this?" The interview questions were intentionally written in an informal, non-threatening manner so as to set participants at ease. Seven such questions were posed in which the participant answered and typically provided a reason for their answer and occasionally an example. Due to the consistency and structure of the interview protocol, student and teacher interviews would be valuable in assuring triangulation in this study.

Questionnaire on Teacher Interaction (QTI)

Studies thus far mentioned have typically used the Questionnaire on Teacher Interaction (QTI), My Class Inventory (MCI), Science Laboratory Environment Inventory (SLEI), or the School-Level Environment Questionnaire (SLEQ). The QTI was considered adequate in addressing the concepts of effective teaching and learning perceptions of teachers and students, alike. The rationale for this is explained in the following paragraphs.

The QTI has shown to be a valuable and versatile tool for it is able to be used as a non-threatening survey to ascertain: 1) how students perceived their teacher, and 2) how teachers perceived their teaching dispositions as a teacher. In all formats, the QTI has been shown to be a valid and reliable instrument in the Netherlands (Wubbels & Levy, 1993), the United States (Wubbels and Levy, 1991), and in Australia (Wubbels, 1993). In the pilot study in Australia, the QTI, containing 48 items, provided strong evidence for internal validity and potential usefulness (Fisher, Fraser, & Wubbels, 1993). In a follow-up study, Rickards and Fisher (1998) found that with a large data base of more than 3,589 students in 173 science classes, that reliability scores for individual student scores ranged from .63 to .88 when used with individual students, and from .78 to .96 when used with class mean as the unit of analysis.

The instrument chosen for this study was the Australian version of the QTI (Fisher, Fraser, & Wubbels, 1993) based primarily on its validity and internal consistency, but more practically, because of its time efficiency in surveying an entire class. It was considered more economical in that it was shorter and thus more quickly administered to students. This factor of time being taken away from other school matters was a grave concern with at least one district superintendent who I approached in the early formational stage of this study. This made the QTI the best instrument for use in this study.

The QTI has been shown to be a reliable instrument. Reliability is measured in terms of the ratio of true score variance to observed score variance, and a reliable test or survey should minimize the measurement error so that the error is not highly correlated with the true score. In contrast, the relationship between true score and observed score should be strong. Cronbach's alpha coefficient examines this relationship and the higher the alpha coefficient the more reliable the test. Though there is no official line of demarcation, Nunnally (1978) has indicated that a reliability coefficient of 0.7 and above is acceptable for comparisons among groups. The QTI is, therefore, within the acceptable range for being a reliable instrument for use with individual and class means as a unit. In this study my objective was to compare class mean scores to that with the respective teacher's mean scores.

Further cross-validation supported the internal consistency of the QTI with either individual students or as analysis of class mean as a unit. It was further found that the QTI is capable of differentiating between the "perceptions of students in different classrooms" (Rickards & Fisher, 1996, n.p.). With class membership, the QTI using one-way ANOVA, provided scale differentiation to be significant ($p<.001$) between classes and the *eta2* statistic, which represented the proportion of variance explained by class membership, ranged from 0.22 to 0.35 for different classes (Rickards & Fisher, 1996, n.p.).

The QTI student and teacher versions were adopted to assess perceptions of effective teaching and learning. The measures were a subset of those included on a survey administered to middle level students in the autumn of 2002. All measures were specific to science classes. Survey items assessed middle level students' perceptions of effective teaching and learning, as viewed in their perceptions of their science teachers' dispositions. All items were on 5-point response scales, anchored with 1 = "never" to 5 = "always". The internal consistency of scales was assessed with Cronbach's alpha (Cronbach, 1951) and used the scales $\alpha \geq .76$ for student-teacher measures for acceptability.

Interview protocols

An interview protocol was used with each participant interviewed. The interview protocol questions are shown in Figure 3.1.

Figure 3.1. Interview questions used as protocol in teacher/student interviews

1. Describe your teacher's classroom behaviour? What kind of person is your teacher in the classroom?
2. Explain your teacher's use of competition and cooperation in the classroom. Which does the teacher use the most?
3. Would you say that your teacher is more friendly or more helpful? Explain why you think this.
4. Would you say that your teacher is more strict or more likely to give you responsibilities and privileges? Explain why you feel this way.
5. When considering your teacher's actions in class, would you say that he/she is satisfied or dissatisfied with being a teacher? What makes you say this?
6. Would you say that your teacher helps students behave more by making strict rules or by encouraging students to do what is right? Why do you think this?
7. What kind of practices does your teacher do in class that helps you to learn best? Explain.

These questions were designed simply by reading through the QTI survey, as well as noting the eight domains being surveyed in the QTI. The purpose of the interview protocol was to provide consistency in interviewing various participants. It was believed that the interviews would provide verification for what was being surveyed, insofar as intentions are concerned. As with the QTI, the same questions were used for both students and teachers, with the exception that teachers merely answered from their own perception as the classroom teacher. For example, using question 5 above, the teacher would be asked, "Would you say that you help students behave more by making strict rules or by encouraging students to do what is right? Why do you think this?" A copy of the actual "common" interview protocol is provided in Appendix E.

Cooperating schools, teachers, and students

Students representing a cross section of mainstream public and private schools in the State of Ohio were included in the sample, which is believed to be representative of the target population, typical of middle schools located within Ohio. From a population of approximately 806 school districts in Ohio (representing approximately 500,000 middle students in the entire State system), 33 middle schools were randomly sampled (probability sample) from the *Ohio Educational Directory* (2001-2002) and invited to participate in the study. In order to obtain a confidence level of 95%, it was determined that a minimum of 356 middle school students would need to be surveyed in order to provide a 95 percent confidence interval and population size, p=.05 (Creative research systems, 2001). This study surveyed 445 participants; 433 students and 12 teachers from 12 different middle level schools.

In July 2002, a letter describing the study rationale and procedure was mailed to principals of 33 randomly selected public and private schools. Following this mailing, an equal number of the same letter was sent out to 33 heads of science in these schools (see Appendix A). Recoupment letters were posted in early December 2002 (see Appendix B). Data were collected during the period between November 2002 and March 2003.

The respondents were volunteer science teachers and their respective middle school students between grades 5-9, resulting in 12 science teacher participants and 433 student participants. Nineteen classes representing 12 schools from various school districts within the State of Ohio school system made up the population. In addition to the 445 surveys, convenience samples were selected for interviews. Some correspondence noted that other schools would have liked to participate; however, their respective school districts had standing rules which restrained them for doing so. Others showed suspicion in the study being conducted under the auspices of a "foreign" university. These factors were not known until after the study concluded and would probably have had a bearing on the number participants.

Phase 2: Survey with the QTI and Analysing the Data

In this study, participants were administered the self-report QTI questionnaire. Students responded to 48 items that assessed perceptions of the science classroom learning environment, as provided by their science teacher. A five-point Likert scale (1 = "never" to 5 = "always") was employed. A comprehensive review of the literature by Assor and Connell (1992) documented the validity of student self-reports of students in grade 5 (age 10), and older, although responses may be biased by the student's tendency to respond in a manner that is socially desirable. McCaslin and Good (1996) found the same to be true concerning student interviews.

Research summarised by Schunk and Meece (1992) demonstrated that student perceptions can mediate the relations between the classroom, school environment and student achievement. Spence, Dupree, and Hartmann (1997) moreover proposed a focus on adolescents' phenomenological experience as an important predictor of learning attitudes. Therefore, students reported on their perception of their school environment, classroom environment, their motivational beliefs, and use of learning strategies.

The QTI instrument was used to survey this convenience sample, along with their respective science teachers. On the day that a sample survey was administered, the classroom science teacher read a brief script to the students describing the study, and the directions for completing the questionnaire (see Appendix D). Middle level students were surveyed during a typical science class. Participants completed the questionnaire in approximately 20 minutes or less. A post-survey was not necessary for this study, however, this practice would provide important data to additional questions pertaining to whether a students' perception becomes more aligned with that of their teachers' perception as the school year progresses.

Quantitative data were collected from the completed surveys of middle level students and their respective science teachers. Item responses were tallied and averages for each class were determined. Factor analysis was employed to confirm the reliability and validity of the QTI employed in this study and found consistent with previous studies. Comparisons of classes (of students) to teacher were analysed.

Phase 3: Interviews with Teachers and Students to Clarify Questionnaire Results

Qualitative data were collected from students and teachers, alike, using the interview protocol. Of the 12 schools, of which 21 classes participated, six students and teachers were selected for impromptu interviews for the purpose of clarification of survey responses.

Triangulation, as defined by Gall, Gall, & Borg (2003), is a means of "using multiple data-collection methods, data sources, analysts, or theories as corroborative evidence for the validity of qualitative research findings" (p. 640). In order to provide clarity and a means of *triangulation* to this study, in addition to the QTI, six students and six teachers were also selected for personal interviews as a convenience sample. The interviews were conducted in person, either by myself or a trained graduate education student, during various stages of the study. This convenience sampling provided qualitative data for comparison with the quantitative data from the survey method implemented. Most of these interviews were completed either just before the survey was administered or shortly after the survey was administered. These were conducted semi-formally in that the participant did not know the interviewer. The protocol provided clarification and identified areas that might hinder or distort survey results due to vocabulary or other misconceptions (see Appendix E).

Phase 4: Collecting Student Achievement for Comparative Purposes

Science grades for the latest marking periods (typically six or nine weeks) were provided by the participating teacher for each participating student. These were non-standardised grades recorded by the teacher and reported to parents by way of periodical reports sent to the student's home, in the form of a report card. These grades were used for comparative purposes, such as calculating standardized z scores, with the intent of comparing student science achievement in relation to their perception of effective teaching and learning with that of their science teachers' perception. All raw data collected during the study was recorded using Microsoft Excel, and then stored on a CD-ROM.

Ethical Issues

Permission and interest was sought from principal in each of the schools being sampled. A written guarantee of privacy and confidentiality was provided. Cooperating science teachers also were informed of the nature of the study and the data being sought. Teachers were provided with permission requests though many of them simply used prior permission sheets completed by the parents of students. Students were told that their opinions are being sought and that now would be a good time to share some of their feelings about learning. Teachers administered the surveys, as well as participated by completing the teacher's version of the survey. Additional information was requested from the teacher regarding student achievement, namely in the form of a six or nine weeks science grade. The information was to be collected with as little disruption to the normal class routine as possible. Data were collected by the students' science teachers and returned directly to this researcher, eliminating access or handling by other parties. In many cases, teachers assured anonymity either by instructing students to use their Christian name or by assigning students a code. Information was collected from students and teachers, and upon receipt made anonymous. Data were tallied in such a way as to protect each school's anonymity. The opportunity for feedback was provided to the school science teaching participating in the study. Personal classroom analyses were generated for respective teachers making such a request.

Chapter Summary

This chapter has provided a description of the research design and the procedures followed to complete the current study and the rationale that prompted the use of both qualitative and quantitative research methods. The chapter presented the research hypotheses and three research questions that guided the study and justified the initial selection of the teacher interpersonal behaviour as a central focus of this study. Chapter Four will discuss the findings of this study concerning students' general perceptions of the learning environment as nurtured by their middle level science teacher. The results of the surveys administered to middle school students and their science teachers will be discussed in lieu of the research questions posed in Chapter One.

CHAPTER 4

RESULTS FROM THE QUESIONNAIRE ON TEACHER INTERACTION AND INTERVIEWS WITH TEACHERS AND STUDENTS

Introduction

Chapter Four consists of a detailed summary and discussion of the findings which surfaced from the surveys administered to middle level science students and their respective teachers. The purpose of the survey was to determine students' general perceptions of their science teachers' basic concepts and practices of effective teaching and learning. Issues considered included:

- students' attitude toward the learning environment promoted by their science teacher,
- the science teacher's self-analysis of his or her own perception of effective teaching and learning as perceived by the learning environment he or she promoted, and
- students' grade in comparison to the differences between the students' and teacher's perceptions.

Most of the personal interviews revealed that in several places the wording in the survey may not have been fully understood or may have been misunderstood by students at the time of the surveying. Some of the comments centred on the fact that the words were "misspelled", as a result of this researcher using the Australian version of the QTI. Most comments provided examples and anecdotes regarding the teacher's instructional practices. Also discussed in this chapter is the substantiating (and disconfirming) information that was provided by teachers and students during interviews.

It should be noted that these are based upon only the students' and teachers' perceptions, as recorded with the QTI. As anticipated, students' input by way of the

QTI and numerous personal interviews provided insightful and internally consistent data.

Analysis of Qualitative Data

Interviews were conducted during the duration of this research project with science teachers and students on a random, convenience basis in order to clarify possible problems between interviewees and the QTI. The random nature of the selections provided confidence that the sample interviewed would be impartial. Appendix E contains a copy of the interview protocol that was followed during the interviews. Appendices F and G contain the compiled comments and remarks made by teachers and students during the interview session. These data sheets have been compiled in order to produce a "snapshot" of how the interviewees understood or interpreted the QTI. The protocol in Appendices F and G are arranged so that student A is referring to teacher A, etc. The purpose of the interviews were to provide a measure for qualitative data, so as to clarify and verify whether the questionnaire was actually being answered according to how the interviewees (whether student or teacher) perceived they were answering using the Likert scale. Verbatim quotes were used in the recording of these in order to avoid misrepresenting teacher and student comments.

An example of a comparison for Item 7 on the interview protocol is shown in Appendix H. This question is singled out due to it being parallel to, and in accord with, the very core of the study. The student participant was asked, "What kind of practices does your teacher do in class that helps you to learn best? Explain." Teachers were asked a variation of this question which personalised it for them, such as, "What kind of practices do you, as a teacher, do in your class that helps students learn best?" Surprisingly, what teachers and students stated were typically in harmony with one another. In conclusion, it was found that the interviews did provide evidence that what the participant answered on the QTI is what they intended to say. From the analysis of the student-teacher interviews, and their respective scoring on the QTI, it appears that the QTI was a sufficient instrument in recording the participants' perceptions. Also, as illustrated in the table in Appendix H, there appears to be uniformity and consistency in what students' say about a

teacher's teaching disposition in relationship to that of the classroom environment with that of the teachers' concept.

A few anomalies did surface during the study. It appears that from a qualitative standpoint that students are, in fact, far more resilient than we might presuppose. From personal observation, along with that of several associates, we discovered that while observing some teachers, the observer came away with a very poor opinion of some teachers' demeanour, attitude, and teaching disposition. To state it bluntly, there were teachers who one would not consider very effective in their manner of teaching and would be expected to be very disliked by students. They were often crude in their mannerisms or methods. Sometimes the ineffectiveness was considered their pedagogical routines, which often amount to less than that of student participation. The dilemma became obvious upon examination of the QTI data from students and comparing it with that of their students. It was found that in almost every case, students not only liked these teachers, but respected them as well. This is not to say that they did not suffer academically but affectively they were accepting of that teacher. It was as if the students, as a class, have an affective range of acceptance and if as long as the teacher did not cross those parameters, then the students were accepting. This proved to be a significant lesson for the observers who expected students to strongly dislike these teachers, and yet, their QTI data stated otherwise. The dualism of using qualitative and quantitative methods of research was useful in the contrast that was made which otherwise may have gone undetected.

Each research question was addressed in light of the data provided by the QTI and the individual interviews with middle level students. Because of the difficulty in presenting large amounts of qualitative data in raw format, findings included have been selected for relevance and were summarised as true as possible to the spirit of the students' responses. The quantitative data relevant to research questions were stored on spreadsheets. The qualitative data were recorded on an interview protocol. The qualitative data originate from the interview questions, which were derived from the QTI.

Research question 1 was: *What are students' and teachers' perceptions about effective teaching and learning?* All of the results upon which the discussion was based represent only the students' and teachers' perceptions. Appendix F provides a summation of the interviews with students. Appendix G provides a summation of the interviews with their respective science teachers. The interviews were convenience sampled and formal in the sense that the teachers and students were not familiar with the interviewer. The results were considered in comparison to the teachers' perception as recorded with the QTI.

Interview Question One: Teacher Classroom Behaviour

Each interview question will be discussed in order that the questions were posed. In regards to Research question 1, students and teachers alike provided very insightful comments. Students had much to say about their respective teacher and his or her disposition and effectiveness of teaching. These will be discussed in the order the questions were asked.

Interview Question 1 asked, "Describe your teacher's classroom behaviour? What kind of person is your teacher in the classroom?" Student responses included:

> *Mrs. N. is a good teacher who usually doesn't tolerate fooling around. She is a good person in the classroom.*
>
> *Ok sometimes. Nice.*
>
> *Mrs. G. is really an awesome teacher. She jokes and has fun with us, and gets involved with what we think. She often relates to us by talking about when she was a teen.*
>
> *Kind; she is understanding.*
>
> *Mrs. S. is a great teacher. She will explain everything over if we don't understand. She is a fun person to be with and she never puts anyone down. She will let us have fun at an appropriate*

measure but when we get out of control she will correct us. She is not harsh and she is very understanding. She is always there for you and will never turn you away. If you have a question she makes you feel comfortable asking it. She doesn't make you feel stupid asking it. She is not one of the teachers who think her way is the only way. She always asks of our opinion.

In the classroom my teacher is well-organized relaxed and ready to start each day.

From these middle level student comments one can determine that students are much attuned to the classroom environment, as established by their respective science teacher. We can ascertain that the students were able to recognise various aspects which they believed were good pedagogical practices. For example, a sense of discipline (*usually doesn't tolerate fooling around*) was discussed by one student. The need and benefits of having fun and a sense of humour (*jokes and has fun with us*) was considered an important tool by another. That kindness and understanding facilitates learning, as well as patience in explaining concepts until they are understood (*explain everything over if we don't understand*) was an insightful reply by one middle school student. The students appeared to recognise how learning is facilitated by organisation and with a non-threatening environment (*teacher is well-organized relaxed* [sic]).

Regarding the same interview question, we now note the responses made by the science teachers. The teacher responses included:

Structured teachers like to establish an environment in which children are comfortable, a little more formal; material displayed in a variety of ways.

Orderly, controlled, some humour, some

I like the atmosphere in my room to be relaxed, so that the students feel comfortable enough to ask me questions or

make comments. I believe I have a good sense of humour & I like to joke around to an extent.

My goal is to treat the students as individuals, provide them with a positive atmosphere and enhance their knowledge.

I am an organized teacher. I think students feel best when we have an established routine. I have certain expectations and the students understand their required behaviour.

I try to conduct myself in a professional manner, using a blend of humour, knowledge, and storytelling during instruction. If the class is interesting, students will learn.

Here we take notice of more depth on the philosophy of effective teaching and learning. These seasoned teachers have definite ideas regarding how a classroom teacher should conduct him or herself and how they plan to accomplish their educational objectives. One important trend that begins here and will continue throughout the comparison of the interviewees' responses is that a great deal of what the students stated about their teacher's disposition and classroom environment elements coincided with what the teachers testified to during the interview.

When comparing the previous remarks by the students in comparison with the remarks above by the teachers, we begin to distinguish commonalities in their answers. Comfortable and relaxed environment, orderly use of humour, established routines and high standards were all elements mentioned during the interviews by both students and teachers regarding descriptions of their science teacher's classroom behaviour.

In Appendix F and G, one can compare a student's response to that of their respective teacher's response. For example in interview question 1 Student A is a pupil in the middle level science class taught by Teacher A, and so on. In comparing Student A with Teacher A, we note that the student likes this teacher who maintains an orderly class. The teacher noted in the interview that she likes to be structured, but

with a comfortable atmosphere that is just a bit on the formal side. Student A is very cognisant of the classroom environment provided by Teacher A and seems to have a positive feeling about the teacher.

Interview Question Two: Teachers Use of Competition Versus Cooperation

Interview Question 2 asked, "Explain your teachers' use of competition and cooperation in the classroom. Which does the teacher use the most?" Student responses included:

> *She uses cooperation most. She makes sure everyone pays attention.*
>
> *Good. Cooperation* [sic].
>
> *Because we're a more mature class, there is definitely more cooperation because she often lets us do things we like.*
>
> *Cooperation, she uses to help learn.*
>
> *Mrs. S. encourages us to cooperate more in the classroom. She will have us work in pairs to figure out problems and she will never say something like how come you're not as smart as this person. She has always taught us to learn from our mistakes. If one of my friends doesn't get something I will help her out, rather than worry if she is going to do better on the test than I am.*
>
> *The only way my teacher is competitive is when we play review games before tests. Most of the time he is cooperative.*

According to their comments, these middle level students easily recognised the dichotomy between competition and cooperation in the classroom. The students were

unanimous that their respective teachers attempted to promote a more cooperative spirit in the classroom rather than competition. With their responses, one can deduce that they preferred cooperative learning, whether it was demonstrated in the ability to work in groups or simply to have choices that they could make regarding their learning. It is fair to say that students in this interview like cooperative learning and would consider it a means of effective teaching and learning.

Regarding interview question 2, we now note the responses made by the science teachers. The teacher responses included:

> *Cooperation is the only thing emphasized; competition may arise from students against students; test results for students.*
>
> *Very little competition. Has meaningful effect on grade. Cooperative as much as possible. Cooperative.*
>
> *I use cooperation much more than competition. I do a lot of group work & cooperative learning activities. The students will always get the chance to be competitive when it is time for individual tests.*
>
> *Sometimes I have students work together to help each other. Competition is a bit trickier as it will motivate some but discourage others.*
>
> *Students work in the lab in small groups. All students are responsible for the final responses to group projects.*
>
> *I believe that my students need the opportunity to work in cooperative groups, since most jobs require this ability. I do not foster a sense of competition in my classroom.*

Each teacher interviewed perceived that they are more collaborative and cooperative in their approach to teaching and learning than they are competitive. As a classroom teacher and as teacher-trainer, I have had the opportunity to observe a large number of teachers and have found that a large percentage are not practising cooperative learning and many do not use collaborative approaches to teaching. My first thought, early in this study, was that the results would be mixed. When I noticed that every teacher reported practising cooperative methods, I assumed that this would be a case of stating that one is cooperative, but practising otherwise. After all, these are *perceptions* that we are investigating. However, it has become clear from the responses of the student interviews that each teacher did, in fact, perceive themselves in the same manner as did their respective students. Whether the results would have been different with a larger number of interviews in this population is not known.

Interview Question Three: Teacher Friendliness Versus Helpfulness

The third interview question asked, "Would you say that your teacher is more friendly or more helpful? Explain why you think this. "Typical student responses to the third interview question were as follows:

> *She is more helpful because although she can be friendly, she explains things thoroughly.*
>
> *Helpful. Helps when you ask for it.*
>
> *I would say both because she helps us a lot in friendly ways, which helps us understand what we don't.*
>
> *Both, uses friendliness to show you can go to her for help.*
>
> *I think Mrs. S. is more helpful. She is nice but definitely more helpful. She will always be there to help all of us and she does it in a serious manner. She realizes that our #1 goal is to live a good life and during her teaching she focuses more on that than her own goals.*

My teacher is both because he walks with a smile and he does help us out. He always asks hows your day or how have you been going.

This question sought to require students to choose from two good characteristics: that of being helpful or that of being friendly. In essence this question originated from the QTI, but was written in such a manner as to elicit additional information by recognising that friendly and helpful are not the same attribute, even though both are desirable and probably facilitate learning. These were queried on the QTI (see Appendix D) in questions 25, 29, 33, 37, 41 and 45. Statements presented on the QTI included, "This teacher helps us with our work", "This teacher is friendly", "This teacher is someone we can depend on", "This teacher has a sense of humour", "This teacher can take a joke", and finally, "This teacher's class is pleasant". In this study, students, generally, did not rate their teacher as unfriendly.

From the student responses to interview question 3, one can note that though students struggled with the ability to separate "helpful" and "friendly", most indicated that their teachers were more helpful. Though both dispositions are apparently desired, students were able to recognise some distinction when required to do so. With some confidence, we can postulate that one could be friendly but not necessarily facilitate effective teaching and learning. The students who answered in this interview were certainly able to recognize the relationship between the two attributes as they relate to learning.

Regarding interview question 3, we now consider the responses made by the science teachers. The teacher responses included:

Helpful because I am the teacher and not their friend.

Helpful goal is to help, not be their friend.

I think both. I am a friendly person in general but I will always help any student that asks for it or needs it.

I don't see how this is a choice.

I try very hard to seek out the student who is reluctant to ask questions. I believe all students can learn but not all learn the same way.

I am a nice and friendly teacher who also tries to be helpful. Our schedule at the middle school does not give teachers much time to be as helpful as I would like.

Like students, even teachers have difficulty separating the dispositions of helpful and friendly. Some were very clear and almost adamant. Others were uncertain. A few were just as adamant that one cannot separate these two. Though I would readily agree that both of these dispositions are important ingredients in effectively teaching, it may be that those who are able to separate the two might prove to be less effective in the teaching of middle level students. The main point to glean is that the middle school students, like their teachers, were able to demonstrate the ability to decipher the complexities of a classroom learning environment, and in this sample, students recognised another important element in effective teaching and learning. For the teachers, there was a general trend that a teacher is not exactly considered, nor expected to be, a friend to the students, though many expressed affable mannerisms.

Interview Question Four: Teacher Strictness Versus Responsibility

The fourth interview question asked, "Would you say that your teacher is more strict or more likely to give you responsibilities and privileges. Explain why you feel this way." Student responses to the fourth interview question are as follows:

Sometimes she can be strict, but she mostly gives us responsibilities and privileges like homework passes.

Responsibilities & privileges.

She definitely is not strict at all, and does give us our own responsibilities, which makes the class much more easy-going.

Gives responsibility and privileges. She shows trust.

Mrs. S. is more likely to give us privileges because she trusts us and through our behaviour it shows her she can. If we keep her trust she will keep giving us responsibilities and privileges. If we lose it she may have to go to being strict.

Mr. M. in all ways is not strict. For example in study hall if we were good all week we could watch a movie on Friday.

Students unanimously stated that their teacher is not to be considered strict, but rather one who gives responsibilities and privileges. Some examples of privileges mentioned included granting of homework passes, individualised responsibilities, trust, or rewards for meeting expectations. This concept is very important in the middle level grades. As noted in Chapter 1, students this age, especially those just entering a middle school, find a transitional paradox where they would like to be "babied" as in their elementary experience, but are often fearful of the new responsibilities that accompanied new freedoms (NeSmith, 1998). The students interviewed in this study, however, appeared to have a more mature response than previously noted (NeSmith, 1998). Here, we see students recognising the relationship between responsibility and privileges. The teachers gave the following typical responses to this question:

In between because of the role that I see the MS Teacher to be; she wants students to learn to be self sufficient; they are learning in "real little steps."

Use both. In awarding behaviour and more strict if misbehaving. Have to have guidelines.

> *The latter* [responsibilities and rewards]. *I choose to let the students prove to me how responsible they are through how much freedom they can handle. This varies among classes. After a few weeks, I can usually tell how mature & responsible the different groups are.*
>
> *Teach students responsibilities.*
>
> *I am more likely to give responsibilities. Learning involves cooperation.*
>
> *Once the students prove to me that they can act in a mature manner, then I grant them responsibilities and privileges within cooperative learning groups.*

One feature is noteworthy in the teachers' responses. Their answers are reflective and decided. The teachers' responses to interview question 4 indicate that they have thought through this concept of discipline, strictness, responsibilities and privileges. Though this congruence cannot be explained, it is possible that due to previous training or orientation they have dealt with this issue, therefore their students have benefited and advanced beyond that observed by myself in previous studies. Middle school students want the freedom of the early school years, but they must be trained how to handle the responsibility that comes with the freedom. These teachers seem to be moving in the direction which prepares their students, and their students seem to have perceived this disposition for learning.

Interview Question Five: Teacher Satisfaction or Dissatisfaction

The fifth interview question asked, "When considering your teacher's actions in class, would you say that he/she is satisfied or dissatisfied with being a teacher? What makes you say this?" This question originated from the QTI query for uncertain behaviour. Student responses to the fifth interview question typically were as follows:

She is satisfied. You can tell she likes being a teacher even if she gets frustrated sometimes.

Satisfied. Seems like he likes his job.

I would say Mrs. G. loves being a teacher! She talks and relates to us and seems really happy with our work.

Satisfied, you can tell she likes what she does.

I think Mrs. S. is very happy with being a teacher. She comes to work everyday with a smile on her face and is very enthusiastic in her teaching. You can tell she loves her job and she always reflects on how happy she is teaching. She makes everyday a good day because she is never depressed. If she is she will never take her bad day out on us.

He seems satisfied with being a teacher because you can tell he has spent time on making a lesson plan.

The students all perceived their teacher to be satisfied or very satisfied with being a teacher. Uncertainty and discontent plays havoc on a teacher and is not something that can be easily hidden from students. Students typically know whether a teacher likes their job or not by the way they behave and interact. The QTI provided a means of examining this disposition by use of the satisfied or dissatisfied dichotomy. Questions addressing this on the QTI are 27, 31, 39, 43, and 47. The intention here is to attempt to reveal a positive or negative attitude…especially towards one's job and students. From the student responses above, one can see that the message presented by the teacher is received loud and clear. The teachers typically gave the following responses to this question:

Students would perceive me to be satisfied as a teacher b/c I am involved in many activities, plus I try to joke around with them and smile as much as possible.

Never satisfied, believes he can always improve. Dissatisfied (lack of teacher authority).

Satisfied – though my answer would have been different 4 years ago. With experience & time the job gets easier & more enjoyable. Also, having higher level students or students who are friendly & willing to work makes the job better also.

Satisfied.

I love what I do. Other than being a stay at home mom, nothing could be more fulfilling.

Students can tell very quickly if a teacher enjoys his/her job or is working just for a pay check. There is not a doubt in my mind that I am a teacher because I enjoy helping children.

From the responses of the teachers to interview question 5, one would have to agree that there is a strong air of dedication present, but there is something more than just dedication. These teachers, as their students have perceived, apparently like and enjoy what they are doing. It could be said that some of these teachers even love the profession of teaching. Students recognise these tell-tale signs and a teacher ending up on the negative end of this is going to find that students respond to his or her attempts to teach differently than one who enjoys what they are doing. It appears that the "dissatisfied" scale is negatively associated with cognitive achievement (Rickards & Fisher, 1996).

This question was probably easier for the students to answer than for the teachers. The students can be frank and upfront with what they believe here, however, the teacher requires a lot of self-confidence not to answer it according to what one thinks the researcher wants to hear. In other words, it is believed that most teachers who are not satisfied with their job are not going to answer with openness. In this study, the students' answers validated that of the teachers.

Interview Question Six: Teacher Strictness Versus Encouragement

The sixth interview question asked, "Would you say that your teacher helps students behave more by making strict rules or by encouraging students to do what is right? Why do you think this?" This concept is queried in the QTI in questions regarding strictness (28, 32, 36, 40, 44, and 48) and regarding admonishment (4, 8, 12, 16, 20, and 24). An example of the former, as stated in the QTI is, "We have to be silent in this teacher's class." An example of the latter, as stated in the QTI is, "This teacher gets angry unexpectedly."

> *Honestly, it is probably more strict rules because she does give chances, but she's got a lot of rules for us.*
>
> *Do what is right.*
>
> *She's not strict, so she encourages us to do what's right & what we feel is right.*
>
> *Encourages us to do what is right.*
>
> *I think Mrs. S. helps us by encouraging us to do what is right. If we do something wrong she will correct us, tell us what we are doing wrong, help us fix our problem like talking, knuckle cracking, etc., and she will praise us when we do what is right.*

He is encouraging because if we forget our book or a folder he lets us go get it in beginning of class.

For the most part, the students interviewed were positive that their teacher encourages them to do what is right. This does not, however, provide us with any continuum to determine the various degrees of strictness that might exist. One student denotes some form of encouragement whereas another by being lenient. One goes into detail how their teacher works with them to work out their own problems. One student conveys that they think their teacher very strict, and provides the reason as numerous rules and pardons. We will consider this student's response in the next paragraph. Students who were interviewed answered question 6 in various ways.

The students make their own rules at the beginning of the year; she says its encouraging b/c she takes away bonus points for misbehaviour instead of serious discipline.

Do both. You have to have rules and have to encourage to help them reach their goals.

The latter, however sometimes strict rules are needed in the classroom. You can't have a room that is out of control b/c nobody will learn in that environment.

Encouraging students to do what is right in a framework of Basic Rules.

I am a strong believer in person responsibility.

Although rules are necessary for a class to run smoothly, I try to help students to focus on the choices they are making and to improve those choices.

This question overlaps with that regarding student responsibility. From the responses one can infer that somewhat of a dilemma exist for a classroom teacher who must

"keep order", if you will, to being the creative motivator for all children. Not a single teacher could answer the question without mentioning both sectors, with the exception of one who simply managed to evade the question altogether. This, like interview question 2 requires the participant to split hairs. These teachers probably answer just as I would. For a classroom teacher to think of trying to run a class without rules causes one's blood pressure to rise very high and their hands begin to shake fear.

To be fair, we once again compared the students' responses to this question with that of their teacher. The most obvious is that nearly every student perceived their teacher to be more of an encourager to do right than a rule-oriented legalist. The teachers' responses, however, seem to emphasise the rules. So, in the true spirit of this study, we must conclude that the students perceive their teacher to be an encourager to do what is right. The teachers, however, realise and recognise that rules do play an important part of teaching self-discipline, and they are not about to give that aspect up. Lastly, we need to consider student A who is attempting to be honest by stating that his or her teacher is strict because of "*she's got a lot of rules for us"*. At first glance this seems to provide us with insight that this teacher is somewhat of the dominant type. However, notice the response given by Teacher A, *"The students make their own rules at the beginning of the year; I say its encouraging because I take away bonus points for misbehaviour instead of serious discipline."* This does not sound like a teacher who enjoys making rules or hording over children to "catch them". This does, however, sound like a situation where either the student has forgotten that he or she made their own rules to follows, or, that this teacher has failed to keep before the students that these are the students' rules and that she is simply there to assist them in keeping them.

Interview Question Seven: Teacher Pedagogical Practices

The seventh, and last, interview question asked, "What kind of practices does your teacher use in class that helps you to learn best? Explain." Students who were interviewed answered question 7 in the following manner.

She always explains stuff real clearly, by giving us an intro on the chapter or explaining a project as thorough as she can.

Demonstration.

Group work RULES! We do group and interacting and communicating helps a lot of us learn best.

Shows a lot of examples on the board, and will work one on one.

The practices that she uses that helps us to learn best is that she adjusts all her teaching skills to our learning styles. Some of us have to be sight taught. Others of us have to be read to and then we get it. She does demonstrations of what she is trying to teach, through experiments. She will do anything to help us grasp the concept that she is teaching.

My teacher does a lot of group work and visual aids. One time we got to use a slinky to imitate earthquake waves.

This section makes available us with vital information in the area of effective teaching and learning not linked to the QTI, for it will provides a comparison of what students think the teacher does that facilitates learning compared to what the teacher thinks facilitates learning for his or her students. From the above comments several strategies which students believe enable them to learn best can be noted. These include: clear explanations, chapter prefaces, demonstrations, collaborative learning, whole class examples, private one-on-one assistance, exercising various modalities and accommodating for different learning styles, experiments, hands-on activities and a willingness to go the extra mile. Once could not get a better list from the latest technical book on how to teach. These items shared by the students during an

interview are quite innocent and from their own educational experiences. Following are typical interview responses of the teachers to question 7.

> *Vary the way I teach by using different methods in the way students learn and how they provide information back.*
>
> *Variety of stimuli. Write, hear, read. When possible use hands on.*
>
> *Activities & group work. Some kids learn best w/ these strategies. Some students like individual work such as notes/lecture. I try to do a bit of both.*
>
> *Practice. Individual attention.*
>
> *I talk to the students about individual learning styles and help them discover what their personal style is so they can maximize their educational experiences.*
>
> *I believe that good teachers use all kinds of methods to deliver instruction. I like to use cooperative learning groups and computer technology in my lessons.*

Table 4.1 presents a comparison of the responses from the students and their respective teachers regarding how they learn "best". Table 4.1 is extrapolated from the survey responses comparing that of students and teachers. The purpose of the table is to provide the reader with a visual means to validate that many students are very mindful of what is effective for them in the areas of teaching and learning. From the comparison, it can be observed that there are a few strategies that students suggested that were not, for whatever reason, noted by the teachers. It is possible that this is a concept of modalities and learning styles, but there is a need to consider the basics of simple explanations, class wide and on an individual basis until the students understand.

Comparison of Students and Teacher Interview Reponses

The participant responses to this question are very specific in nature. One can only wonder what effect it might have if teachers actually spent more time talking to their students about strategies that work for them. What are significant in Table 4.1 may well be the few items teachers did not mention. Students may have more strategic ideas for learning that have not yet been tapped.

Table 4.1. Comparison of students' response and teachers' responses to interview question 7, regarding strategies for learning

Students' Responses	**Teachers' Response** ✓ = if mentioned in teacher response
clear explanations	
chapter prefaces	
demonstrations	
collaborative learning	✓✓
whole class examples	✓
private one-on-one assistance	✓
exercising various modalities	✓✓✓✓
accommodating for different learning styles	✓✓✓✓
experiments	
hands-on activities	✓✓✓
a willingness to go the extra mile	
	practice
	individual work
	computer technology

Table 4.2 provides a comparison specifically for one student with their respective teacher. This will enable the reader to compare what the student said explicitly with what that student's science teacher stated.

Table 4.2. Comparison of each students' response with their respect teachers' responses to interview question 7, regarding strategies for learning

	Response	**Year/ Grade**	**Academic Grade**		**Response**
Student 1	She always explains stuff real clearly, by giving us an intro on the chapter or explaining a project as thorough as she can.	7th	95.4%	Teacher 1	Vary the way I teach by using different methods in the way students learn and how they provide information back.
Student 2	Demonstration.	7th	80%	Teacher 2	Variety of stimuli. Write, hear, read. When possible use hands on.
Student 3	Group work RULES! We do group and interacting and communicating helps a lot of us learn best.	9th	85%	Teacher 3	Activities & group work. Some kids learn best w/ these strategies. Some students like individual work such as notes/lecture. I try to do a bit of both.
Student 4	Shows a lot of examples on the board, and will work one on one.	9th	74%	Teacher 4	Practice. Individual attention.
Student 5	The practices that she uses that helps us to learn best is that she adjusts all her teaching skills to our learning styles. Some of us have to be sight taught. Others of us have to be read to and then we get it. She does demonstrations of what she is trying to teach, through experiments. She will do anything to help us grasp the concept that she is teaching.	7th	96%	Teacher 5	I talk to the students about individual learning styles and help them discover what their personal style is so they can maximize their educational experiences.
Student 6	My teacher does a lot of group work and visual aids. One time we got to use a slinky to imitate earthquake waves.	8th	93%	Teacher 6	I believe that good teachers use all kinds of methods to deliver instruction. I like to use cooperative learning groups and computer technology in my lessons.

Students 3 and 6, who apparently both like group work, were likeminded with their teachers, respectively. Student 4, also with his or her teacher, mentions board work and lots of practice and the use of examples, as well as one-on-one assistance. Student 5 reiterates learning styles, almost as though this teacher has addressed this concept with his or her students. From a simple cursory observation of the Table 4.1 we can speculate that students know strategies which improved their learning and we can also

note that teachers have training which equips them to respond to these various individualised student needs. Such are students' and teachers' perceptions about effective teaching and learning. It is of interest to reiterate what Rickards and Fisher's (1996) noted, namely that, "cognitive achievement was higher where the teachers demonstrated more leadership, helpful/friendly and understanding behaviours and less strict, dissatisfied and admonishing behaviours". It appears that the individual class data collected from middle grade science teachers in Ohio generally followed this trend, some more loosely than others.

It is not enough to simply ask whether a difference between a teacher's perceptions of effective teaching is different from that of his or her students'. Nor is it sufficient to ask whether a relationship does, indeed, exist. Research question 2 sets up a prime directive to determine in what ways these perceptions differ. For this reason, research question 2 queried, *in what major ways, if any, do students' perceptions and teachers' perceptions differ?* From the quantitative and qualitative data collected in this study, it appears that the perceptions of teachers and their respective students are very similar. The exception seems to be that teachers tend to view themselves more positively in some areas than do their students. This concurs with that reported by Hagborg (1994) who found that students generally rate teacher methods as more limited and more dependent on teacher direction than do teachers, who perceived their methods as broader and requiring more student participation. This also in accord with that reported by Rickards and Fisher (1998) that teachers always give themselves higher ratings than do students.

Research question 3 queried, in *what ways do differences in student perceptions and teacher perceptions of effective teaching and learning have a significant effect on student achievement?* This is an important question and one that provided impetus for this study. It is the difference between these two variables (student and teacher perceptions) that may provide a clue whether a student's academic achievement (as measured by a class grade) has any relationship to how closely the student's concept of "effective teaching" is from his or her science teacher. As previously noted, perceptions are reality to the one perceiving, thus a different in perception between the student and the teacher regarding what is effective teaching and learning would

presumably have an impact on the student's grade. The quantitative results suggest this to be the case.

Table 4.3 Description of scale and sample items for each scale of the QTI

Scale name	**Description of scale (The extent to which the teacher…)**	**Sample item**
Leadership	…leads, organises, gives orders, determines procedure and structures the classroom situation.	This teacher talks enthusiastically about his/ her subject.
Helping/friendly	…shows interest, behaves in a friendly or considerate manner and inspires confidence and trust.	This teacher helps us with our work.
Understanding	…listens with interest, empathises, shows confidence and understanding and is open with students.	This teacher trusts us.
Student responsibility/ freedom	…gives opportunity for independent work, gives freedom and responsibility to students.	We can decide some things in this teacher's class.
Uncertain	…behaves in an uncertain manner and keeps a low profile.	This teacher seems uncertain.
Dissatisfied	…expresses dissatisfaction, looks unhappy, criticises and waits for silence.	This teacher thinks that we cheat.
Admonishing	…gets angry, express irritation and anger, forbids and punishes.	This teacher gets angry unexpectedly.
Strict	…checks, maintains silence and strictly enforces the rules.	This teacher is strict.

Table 4.3 provides a description of the scales of the QTI with typical example items. The results of using the QTI indicated that several QTI items were noted by teachers as being "ambiguous". These are mentioned here simply to recognise the possibility of misunderstandings possibly due to cultural differences. The questions brought to the attention of this researcher were 1, 3, 7, 9, 21, 26, 30, 40, 43, and 46. Upon closer examination Table 4.3 and 4.4 relate these items to the scales as categorised and the four domains being addressed.

Clusters of items appear to form around two specific sectors, namely that of leadership and student responsibility and/or freedom behaviour. From my observation and perspective, the problem appears to be basically one of nomenclature. For example, one teacher of a 6th grade class told me that her students did not understand the first item, which simply stated, "This teacher talks enthusiastically about her/his subject."

Table 4.4 Comparison between items on the QTI considered ambiguous by teachers with the domain being addressed by the items in question

Domain and sectors addressed in the QTI	**QTI Item number**
Dominance	
Leadership	1, 9, 21
Strict behaviour, leadership behaviour	None
Submission	
Student responsibility/freedom behaviour	26, 30, 46
Uncertain behaviour	3, 7, 23
Cooperation	
Understanding	None
Helpful / friendly	None
Opposition	
Dissatisfied	43
Admonishing	24, 40

She, instead, believed the item is clearer if restated, "This teacher loves her/his subject." A similar answer was given regarding item 9, "This teacher holds our attention." She suggested it should read "This teacher keeps us interested." In summary, it appears that several factors may be responsible for these "ambiguities". Firstly, the Australian version of the QTI was selected for this project because of its long and successful history of being valid and reliable, as well as because of its economic factor in the classroom. Older aged students made comments regarding the British spelling of some words, but this appeared to be insignificant to the participants. Secondly, and closely related to the first, is that with the ambiguities mentioned above were simple terminology which might be more familiar in one society than in another or utilize more in one region than in others. An example from

the QTI will illustrate this point. Items 23 and 24 are worded in a way that would bring almost immediate alarm to one living in the USA. Item 23 states, “It’s easy to make a fool out of this teacher.” Many teachers and students shared that such comments were almost “taboo”. It certainly is not that students have never tried to make a fool of a teacher, but to openly say so appears to produce somewhat of a cognitive disequilibrium. Item 24, likewise, only the problem here seems to be that of a dual meaning or interpretation. To be “sarcastic” in the USA can mean in the negative sense where one belittles students and seek to cause emotional harm at the student’s expense. Another interpretation of this word is to be “sarcastic” in a light-hearted manner, as in “cheeky”, which is considered positive and acceptable. This term could be taken to mean that the teacher kids students about things using play on words, but the fun is not at the students’ expense. This item probably received the largest number of student inquiries during this study, though this was a small number, others may not have shared their possible misunderstanding.

Many of the concerns over words and wording seem to originate from students and teacher from grade 6. This might be an indication that students of this year group do not have the “sophistication” to recognise that though some phrase may not be very familiar, one can interpret it to a more local or culturally practiced concept without losing meaning in the interpretation or spirit of the question. In conclusion, the QTI in the version selected was adequate and understood by most of the participants. To the contrary, students appear to accept such teachers and even show some means of respect for them. Some even speak of them quite fondly.

In Table 4.5 a comparison is drawn between the student’s responses compared with their respective teacher’s responses, from the results of both on the QTI and the interview. This means of comparison enables one to contrast the responses between 1) a teacher and his or her respective teacher, 2) the teacher’s QTI responses with the student’s QTI responses, 3) the teacher’s QTI response with that of their interview response (for item 7, in this case) and, 4) the student’s QTI response with that of their interview response, also for item 7. If comparing the QTI responses of both Teacher A and Student A, one can note that this student has created a fairly accurate perception of his or her teacher. Student A scores for leadership, understanding, uncertainly, helpful/friendly, are nearly identical in scope. Regarding

student/responsibility, and dissatisfied and strict, the student, on each of these, rated his or her teacher to be “more” of the disposition being queried. In other words, Student A perceived his or her teacher to be more discontent, more strict, and yet, more oriented to providing a means of independency (student responsibility and freedom behaviour). This student, who has a perception of his or her teacher nearly equal to that of the teacher, has a grade average of 95.4% for the term.

Table 4.5. Comparison of Student-Teacher Comments for Item 7 on the Interview Protocol with the QTI Scores for the 8 Sectors

Item #7	Teachers' Response		QTI Scores	Students' Response		QTI Scores
7. What kind of practices does your teacher use in class that helps you to learn best? Explain.	A:	Vary the way she teaches by using different methods in the way students learn and how they provide information back.	Lea 21 Und 19 Unc 0 Adm 4 HFr 23 SRe 7 Dis 0 Str 14	A:	She always explains stuff real clearly, by giving us an intro on the chapter or explaining a project as thorough as she can.	Lea 21 Und 21 Unc 1 Adm 5 HFr 20 SRe 12 Dis 5 Str 8 Grade: 95.4
	B:	Variety of stimuli. Write, hear, read. When possible he uses hands on.	Lea 17 Und 18 Unc 5 Adm 8 HFr 18 SRe 10 Dis 9 Str 13	B:	Demonstration.	Lea 19 Und 19 Unc 7 Adm 10 HFr 17 SRe 12 Dis 4 Str 7 Grade: 77%
	C:	Activities & group work. Some kids learn best w/ these strategies. Some students like individual work such as notes/lecture. I try to do a bit of both.	Lea 21 Und 19 Unc 5 Adm 3 HFr 24 SRe 14 Dis 1 Str 5	C:	Group work RULES! We do group and interacting and communicating helps a lot of us learn best.	Lea 24 Und 24 Unc 1 Adm 1 HFr 24 SRe 17 Dis 0 Str 4 Grade: 85%
	D:	Practice. Individual attention.	Lea 22 Und 21 Unc 0 Adm 4 HFr 20 SRe 10 Dis 1 Str 11	D:	Shows a lot of examples on the board, and will work one on one.	Lea 19 Und 20 Unc 0 Adm 6 HFr 23 SRe 10 Dis 4 Str 9 Grade: 74%
	E:	I talk to the students about individual learning styles and help them discover what their personal style is so they can maximize their educational experiences.	Lea 21 Und 23 Unc 1 Adm 0 HFr 23 SRe 12 Dis 0 Str 2	E:	The practices that she uses that helps us to learn best is that she adjusts all her teaching skills to our learning styles. Some of us have to be sight taught. Others of us have to be read to and then we get it. She does demonstrations of what she is trying to teach, through experiments. She will do anything to help us grasp the concept that she is teaching.	Lea 23 Und 23 Unc 0 Adm 0 HFr 24 SRe 10 Dis 0 Str 9 Grade: 96%
	F:	I believe that good teachers use all kinds of methods to deliver instruction. I like to use cooperative learning groups and computer technology in my lessons.	Lea 21 Und 21 Unc 2 Adm 4 HFr 21 SRe 9 Dis 1 Str 9	F:	My teacher does a lot of group work and visual aids. One time we got to use a slinky to imitate earthquake waves.	Lea 18 Und 22 Unc 9 Adm 5 HFr 22 SRe 11 Dis 4 Str 10 Grade: 93%

Table 4.6. Descriptive statistics of the QTI scores for each of the 8 sectors surveyed and responded to by the six teachers and six students interviewed

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
LEA	12	17.00	24.00	20.5833	2.0207
UND	12	18.00	24.00	20.8333	1.8990
UNC	12	.00	9.00	2.5833	3.1176
ADM	12	.00	10.00	4.1667	3.0101
HFR	12	17.00	24.00	21.5833	2.3916
DIS	12	7.00	17.00	11.1667	2.5525
SRE	12	.00	12.00	3.5833	3.9418
STR	12	2.00	14.00	8.4167	3.5280
GRADE	6	74.00	96.00	86.7333	9.5931
Valid N (listwise)	6				

Table 4.6 presents the QTI scale scores for the six teachers and six students interviewed. These descriptive statistics, which are discussed in depth in the next section, only present us with a crude sense of the data collected since the sum of their responses would not apply to anyone other than their respective teacher. For example, in the leadership sector we can note that the lowest score given was 17 and the highest score was 24, with the mean average being approximately 20.9. This statistic informs us that no one accumulated less than 17 points for the leadership score. It does not tell us who recorded the lowest score and to which teacher it applies. This description of the statistics for these twelve interviewees, however, does reveal that these twelve agreed more easily with one another for the sector on understanding and least on the sector on student responsibility and freedom. In order to obtain a more useful comprehension of the dynamics taking place between a teacher and his or her student, we must focus on them as a set of two. This can be arranged by providing several examples of the teacher-student set and examining their individual responses.

The interview protocol records, as shown in Table 4.5, the teacher and student responses to the question, "What kind of practices does your teacher use in class that helps you to learn best?" Teacher A responded with the need to provide various methods according to students' practices of learning. Student A apparently perceived on this pedagogical variety and commented about what means of learning he or she

finds helpful, namely strategies such as clear explanations and directions, as well as introductions to new material. The student perception here validates the teacher's perception of how he or she teaches. Upon closer examination, the QTI scores indicate that the teacher and student respective response scores appear similar, but not as alike that of their teacher's response as noted with Teacher A and Student A.

Figure 4.1 depicts a graph comparing the scores of Teacher A and Student A on the eight scales of the QTI. From this graph one can see that the student's perception of the teacher's classroom disposition is almost the same as that of the teacher's to the same survey. In this case with student A, his or her responses, when visualised with the radar graph is almost a perfect overlay with that of the teacher's.

Figure 4.1 Comparing Teacher A responses with respective Student A responses to the QTI

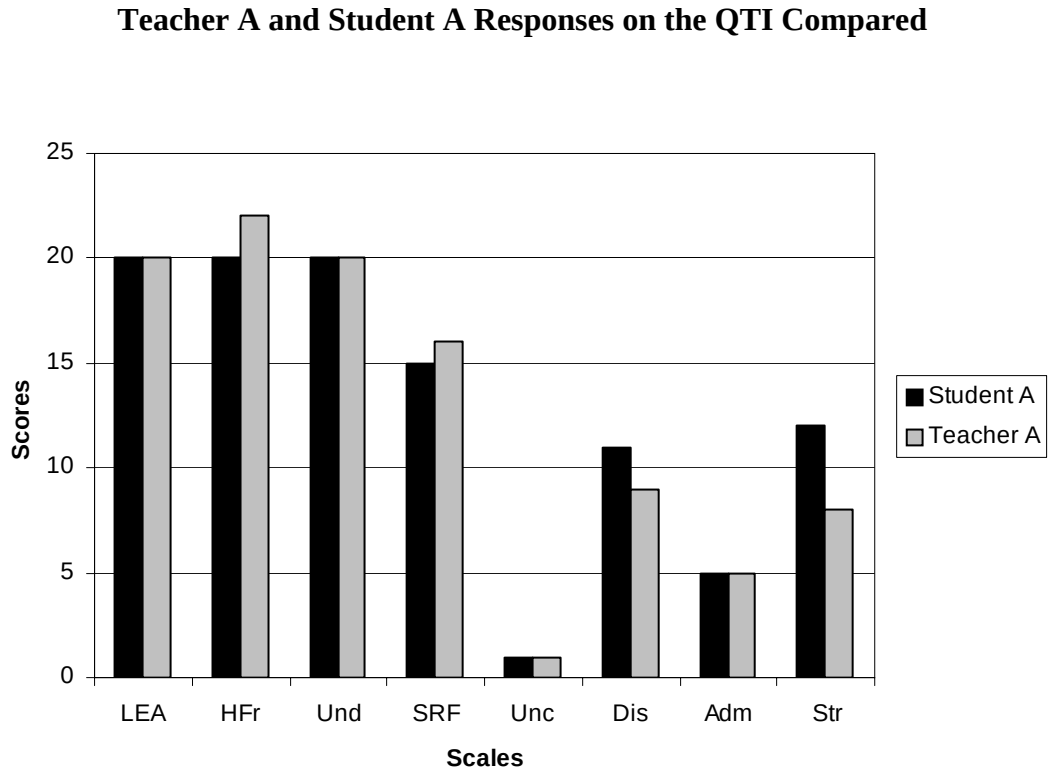
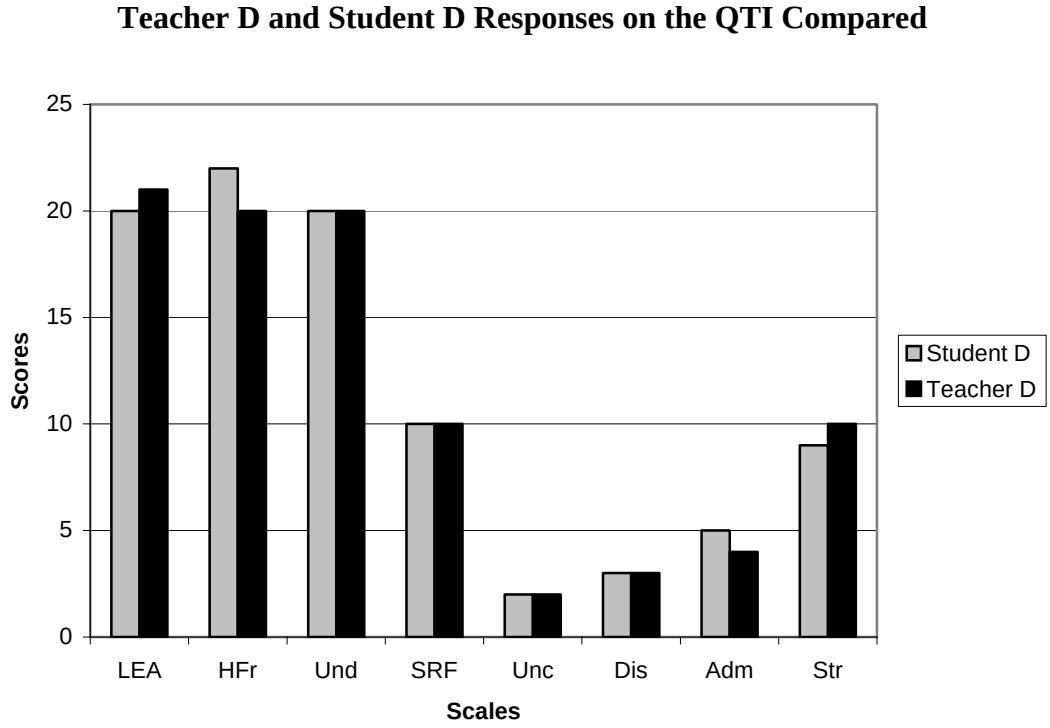


Figure 4.2. Sector profile comparing teacher D responses with respective student D responses to the QTI



Student D, who has a class grade average of 74%, actually has as good a match with his or her teacher as that of student A to teacher A, or better. For example, if we total the difference between teacher A and student A, we find that the difference equals 9 with an average difference being 1.125. When following the same tallies for teacher D and student D, we find that student D has a total difference of 1 with an average difference being 0.125. Note, however, that student A has an achievement grade of 95.4% whereas; student D has an achievement grade of 74%. This leads us to question the viability of the idea that the greater the variance between a teacher and his or her student the lower the student's achievement grade. In this example, the student most resembling the same perception as that of their teacher actually has a lower academic grade. See Table 4.7.

Table 4.7. Comparison of teacher A and student A responses with that of teacher D to student D for difference and average difference using the QTI.

	Lea	HFr	Und	StR	Unc	Dis	Adm	SRe	Grade	Difference	Mean Difference
Teacher A	21	23	19	14	0	7	4	7			
Student A	21	20	21	12	1	12	5	12	95.4		
difference	0	-3	2	-2	1	5	1	5		9	1.125
Teacher D	22	20	21	11	0	1	4	10			
Student D	19	23	20	10	0	4	6	8	74.0		
difference	-3	3	-1	-1	0	3	2	-2		1	0.125

Before analysis of the quantitative data, it seems appropriate to first consider the issue of validity and reliability of the QTI.

Validity and Reliability of the QTI

The following tables provide the statistical analysis performed on the data collected from the QTI. Table 4.8 provides the results for internal consistency using the Cronbach alpha coefficient, utilising both alpha reliability procedure, as well as Analysis of variance (ANOVA). The former measures internal consistency based on the extent to which the participants who answer the survey item one way respond to other items the same way. The latter determines whether the difference between the mean scores of two or more groups on a dependent variable (such as the students' grades) is statistically significant.

Table 4.8 shows the alpha reliability figures of different QTI scales ranged from .60 to .80 when the individual student was used as the unit of analysis. The results for the present sample are similar to those reported by Rickards and Fisher (1996) using a large data base in Australia. They reported a range of .62 to .88.

Another desirable characteristic of any instrument like the QTI is that it is capable of differentiating between the perceptions of students in different classrooms. That is, students within the same class should perceive it relatively similarly, while mean within-class perceptions should vary from class to class. This characteristic was

explored for each scale of the QTI using a one-way ANOVA, with class membership as the main effect. It was found that each QTI scale differentiated significantly (p<.001) between classes and the eta^2 statistic, representing the proportion of variance explained by class membership, ranged from .07 to .48 for different scales. Rickards and Fisher (1996) reported similar results with a range of .17 to .31.

These ANOVA and reliability results taken together attest to the validity of the QTI in this study.

Table 4.8 Internal consistency (Cronbach Alpha Coefficient) and ability to differentiate between classrooms for the QTI

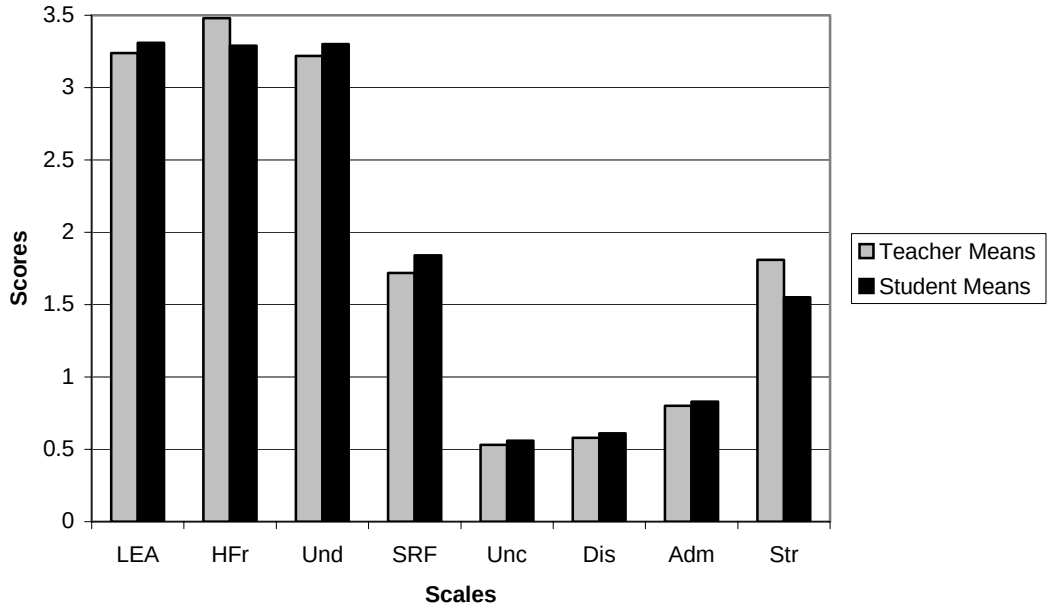
Scale	Unit of Analysis	Alpha Reliability	ANOVA Results (eta^2)
Leadership	Individual	.74	.10*
Helping/friendly	Individual	.80	.48**
Understanding	Individual	.77	.07*
Student responsibility / freedom	Individual	.63	.14**
Uncertain	Individual	.60	.07
Dissatisfied	Individual	.71	.16**
Admonishing	Individual	.74	.22**
Strict	Individual	.64	.14**

*p <.001 n = 433 students in 21 classes.

Analysis of Quantitative Data

Figure 4.9 provides a comparison between the students and the teachers, in an attempt to determine if there are any statistical significant differences between the responses of both groups when considered as a whole.

Figure 4.3 Scale means for teachers and their respective science students' scores on the eight scales of the QTI



There is a striking similarity between the perceptions of teachers and their students which reinforces the qualitative results obtained from the interviews. More detailed information on the descriptive statistics of individual classes is produced in Appendix 1.

Emergent themes from the qualitative data include students' desires to want teachers who are helpful and friendly, and who do not want teachers who are uncertain in their demeanour or who are dissatisfied. These characteristics were at the opposite ends of the spectrum and appear to give students the most problems in learning environments. Teachers rated themselves more helpful/friendly than did the students. They, however, rated themselves less uncertain and/or dissatisfied than did their students. The characteristics measured by the QTI, should be examined in relationship to preadolescent/adolescent development. For example, the dimensions of dominance versus cooperation, one must consider how students this age, who are seeking various levels of independence, react to dominance. It would seem fair to assume that as a student becomes further and further along in developmental stages, that more and more dislike for a learning environment where dominance prevails.

Associations Between Interpersonal Teacher Behaviour and Student Outcomes

Table 4.10 reports the results for associations between students' perceptions of teacher-student interpersonal behaviour and students' achievement outcomes according to their grade report when the data were analysed using both simple and multiple correlations. Whereas the simple correlation *(r)* describes the bivariate association between achievement and a QTI scale, a standardised regression weight (β) characterises the association between achievement and a particular QTI scale when all other QTI dimensions are controlled.

Table 4.9 Associations between QTI Scales and Students' Achievement Outcomes in terms of Simple Correlations *(r)* and Standardised Regression Coefficients (β)

QTI Scale	Strength of Environment – Outcome Association Attitude to Class	
	r	β
Leadership	0.13**	0.06
Helpful/Friendly	0.9	0.03
Understanding	0.06*	0.01
Student Responsibility/Freedom	-0.08	-0.05
Uncertain	-0.21**	-0.06
Dissatisfied	-0.29**	-0.27**
Admonishing	-0.16**	-0.04
Strict	-0.15**	-0.04
Multiple Correlation	R = 0.31**	R^2 = 0.10

*p <.05** p <.01 n=405

An examination of the simple correlation *(r)* figures in Table 4.10 indicates that there were five significant relationships (p <.05), out of eight possible, between student-teacher interactions and student achievement; this is 20 times that expected by chance alone. In classes where the students perceived greater leadership in their teachers their achievement was better. The converse was true when the teacher was perceived as strict and dissatisfied, admonishing or uncertain.

The beta weights show that only one of these associations retains its significance in a more conservative test with all other QTI scales controlled. This was the Dissatisfied scale. In classes where students perceived their teacher as expressing more dissatisfaction their achievement was poorer.

The multiple correlation *(r)* was 0.31 and was statistically significant. The R^2 value of 0.10 indicates that 10% of the variance in students' achievement could be attributed to their perceptions of their teacher's interaction with them.

Chapter Summary

This chapter provided a discussion of the findings of this study concerning students' general perceptions of the learning environment as nurtured by their middle level science teachers. The data findings were compared and contrasted among the various classes surveyed. The results of the surveys administered to middle school students and their science teachers were discussed in lieu of the research questions posed in Chapter One. Several unexpected dilemmas were noted, namely that of students not disliking teachers who are observed as being too rude, too mean, etc., as would be expected. Analysis of the survey data also indicated that students are very close in their perception of what the teachers' concept of effective teaching is, or should be, as practiced in the classroom. Isolated cases could be recognised, and though always, tended to accompany lower than average marks.

This chapter also provide statistical data to verify the reliability and validity of the QTI and its ability to discern between classes at a significant level. Results were provided for the Cronbach Alpha Coefficient, mean score, and standard deviation for student and teacher scores.

When simple and multiple correlation analyses were used to investigate associations of teacher-student interactions with students' achievement, a significant positive relationship emerged for the Leadership scale on the right side of the model. Negative associations were found for all of the scales on the left side of the model. Ten percent of students' achievement could be attributed to their teacher's interpersonal behaviour. General issues regarding, and affecting, the middle level

student will be discussed, as will actual difference in students' perceptions in comparison with their respective teacher. The issue of out-of-field teachers in classrooms will once again be examined and whether this is a significant factor in the educating of middle level students. The research questions will be re-examined in Chapter Five, in light of the data analysis. Implications for methodology and future research will be considered. Finally, deliberation on the limitation of the study and its applications will be submitted, as well as reflection on ethical issues.

CHAPTER 5

STUDENT OUTCOME VARIABLES, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The thesis of this study was that student perceptions of effective learning and teaching is a vital element in a student's success in school academically and probably in their career. It was hypothesised that student achievement, according to the students' (six or nine weeks) grade report, will reflect a correlational relationship with that of their respective teacher's perception. This was tested by three research questions as follows:

Research Question 1

What are students' and teachers' perceptions about effective teaching and learning?

Research Question 2

In what major ways, if any, do students' perceptions and teachers' perceptions differ?

Research Question 3

In what ways do differences in student perceptions and teacher perceptions of effective teaching and learning have a significant effect on student achievement?

This chapter provides an analysis of the statistical data to verify the reliability and validity of the QTI and its ability to discern between classes at a significant level. Results were provided for the Cronbach alpha coefficient, mean score, and standard deviation for student and teacher scores, as well as the mean score and standard deviation for the students' academic grades in comparison with each of the eight sectors of the QTI.

Chapter Five discusses student outcome variables and other measures. Achievement variations with the QTI data are examined in association with students' perception of teachers' dispositions, as noted from teachers' responses on the QTI. General issues regarding and affecting the middle level student are discussed, along with the actual differences in students' perceptions in comparison with their respective teacher. The issue of out-of-field teachers in classrooms is again examined in consideration of whether this might be a significant factor in the educating of middle level students. The research questions will be re-examined in Chapter Five, in light of the data analysis. Implications for methodology and future research will be considered. Reflection on the limitation of the study and its applications will be submitted, as well as reflection on ethical issues. Finally, Chapter Five comprises the conclusion, along with recommendations regarding the concept of student-teacher perceptions of effective teaching and learning, as well as future research implications. A review of main findings in relation to these research questions, along with other key issues and recommendation that arose from the study are made.

General Issues Regarding Middle Level Students

Middle level education, though still in infancy, is a representation of a movement that recognised the inadequacies and failures of the junior high school concept. This ethos has spread throughout the USA, but often with inconsistencies in philosophy and pedagogical practices from one school to the next. The driving force of the movement is founded in that of providing developmentally appropriate educational practices to students who are in the transitional years from childhood to adulthood. "Appropriate" is an important term for student in middle level education and is typically between grades 5 to 9 (which incorporates ages 12 to 16 years of age). It is common knowledge that students in this grouping are far more different from one another than at any other time in life. The developmentally appropriate concept, however, is interpreted in as many ways as there are middle schools. Practices, on the other hand, seem to be centred on the fact that middle level students are very different from one another in rates of maturity, both physically and emotionally. With this in mind, the concept of classroom environment, student-teacher fit, and student success becomes paramount to teachers, principals, parents, the community,

and even the workplace. In an era where testing is over-relied upon and the results of which become the means for judging a teacher's success or failure, it would seem vital to examine the relationship that occurs in the classroom with a teacher and their students. It is, after all, here that students spend the largest portion of their waking hours. The emphasis is misconstrued as it seems the test results are priority, whereas, examining the interaction that occurs between a teacher and his or her students would prove to be a vital asset in facilitating learning. Such a practice would improve the dynamics that occurs in the classroom, thus becoming a more effective tool of education. Effective teaching and learning would then improve the test results. It is important to notice here that the results are not on the test scores, but on the student-teacher interaction.

The Middle School Model of schooling attempts to provide students with a more personalized experience (NSMA, n.d.). This may provide a future study in determining the differences between the middle level and the junior high school with the effects on student achievement. Another aspect growing in popularity and practice in the middle level school is that of the emerging of constructivism (Bruner, 1987; Erickson, 1968; Kohlberg, 1980; Piaget, 1929; and Vygotsky, 1962). This concept is more "helpful/friendly" in that it requires the teacher to know what the student knows and to then link new concepts to past experiences. In our generation, the pedagogical push is towards teachers teaching "developmentally appropriate" lessons, so as to meet the developmental needs of students (Burns, 2002; Ferguson, 1998; Jackson & Davis, 2000; Meece, 2002; Olson, 2002; Fraser, 1997). *Turning Points: Preparing American youth for the 21st Century* (Reforming, 1990), proposed that middle level students need a "…movement to support and educate young adolescents during a formative period of dramatic biological, cognitive and psychosocial changes, increase vulnerability, potential risk and special opportunities" (p. 2). In many ways, these programs and practices are seeking to help students by adjusting to them, rather than requiring them to adjust. In many ways, these programs and practices are seeking to help students by adjusting to them, rather than requiring them to adjust. Such practices, it is believed, will help more students succeed academically and fewer to become disengage and drop out (Olson, 2002). Student-friendly schools are now expected (Burns, 2002; Kramer, 1992; Manning,

2002; Petzko, Clark, Valentine, et al. 2002; Schriver & Czerniak, 1999). The middle level schools are vital for student future success. Student perceptions are valuable tools to help us measure the classroom "temperature", as well as to help us monitor student motivation and achievement (Anderman & Midgley, 1998; Bishop, 1989; Daniels, Kalkman, & McCombs, 2001; Eccles, Midgley, Wigfield, 1993; Ferguson, Forbes, 1996, 1998; Kramer, 1992; Maeroff, 1982, 1996; Robison, 2001; Thomason & Thompson, 1992). Since student motivation, academic success, and classroom environment are so intertwined, the concept of student perceptions of learning is vital.

Achievement Variations in Association to Student Perceptions of Teacher's Interpersonal Behaviour

It was noted that it was teachers' oppositional behaviour that affected achievement based on report grades.

We cannot assume that all teachers grade in the same manner or fashion, however, we can compare how all the students in an individual teacher class has faired in comparison. A problem occurs, however, if one makes more of the grade than one should, for the actual grade issued to a student may not reflect the same meaning from one teacher to the next. This lack of uniformity may place restrictions on comparing various groups as a whole. In order to avoid this dilemma, this study considered student achievement within the context of students' grades from their respective science teacher.

Student-Teacher Perceptions Regarding Effective Teaching and Learning

In examination of the data there appears to be some significant aspects. Students are quite able to evaluate the disposition of their classroom environment, as established by their respective science teacher. Since a preferred and actual survey was not included in this study, whether students found their class to be an environmental fit is indecisive. It does appear that a slight relationship exists between the differences of a student's perception of effective learning and teaching when compared to that of the teacher.

The Significance of Teachers in Out-of-Field Placements

The significance of teachers in out-of-field placements has probably always been a practice in schools of all states, districts, and localities. It is the standards movement which forced this to surface and to become an issue. Research has found that those who are teaching out-of-field will have a very different perception of what is to be taught and how it is to be taught, than that of an individual with training in the same field (Berliner, 1990; Borg & Ascione, 1982; Byrnes, 2001; Stallings, Needles, & Stayrook, 1979; Wenglinsky, 2003). This issue will not go away and truly needs to be dealt with in a head-to-head fashion. In so far as this study is concerned, however, teachers have very clear, and with some exception, accurate perceptions of the classroom environment that they attempt to implement. Students, as well, are very able to identify the ethos in the class environment exerted by their teacher. One might extrapolate from this that whether one is teaching in their field or out-of-field is not the issue, for students will readily pick up on the teacher's teaching disposition. With a teacher who is out-of-field missing the entire picture, per se, for that discipline should be an disconcerting matter since the teachers' perception of what is important in a course appears to be readily picked up by students.

Examining the Research Questions

This brings us to the heart of the matter and the purpose of this study: three basic research questions. Each research question was addressed in light of the data provided by the QTI and the individual interviews with middle level students. Because of the difficulty in presenting large amounts of qualitative data in raw format, findings included have been selected for relevance and were summarised as true as possible to the spirit of the students' responses. The quantitative data relevant to research questions were stored on spreadsheets. It must be noted that most of the personal interviews revealed several terms present in the survey that students may not have fully understood or may have misunderstood at the time of the surveying. Some of the comments centred on the fact that the words were "misspelled", as a result of this researcher using the Australian version of the Wubbels and Levy's QTI

(1993). Most comments provided examples and anecdotes regarding their teacher's instructional practices.

Research Question 1: What are students' and teachers' perceptions about effective teaching and learning?

To answer this question, 433 middle school science students, grades 5 through 9, in the State of Ohio, USA, were surveyed from a random sampling of 12 schools and 12 middle level science teachers. The sampling included private and public schools, and the teachers a mixture including both sexes. In addition, 6 students and 6 teachers were selected in a convenience sampling to be interviewed in order to provide qualitative data to compare with the quantitative data.

Students were generally positive about their perception of their respective science teacher's interpersonal teaching behaviours (dispositions) and thus the classroom learning environment. The results indicated that most students consider their teacher to be both leaders and understanding people. Likewise, most indicated that their teacher was helpful and friendly, and tended to provide students with a means of having some sense of balance and control in the dichotomy of responsibility versus freedom. Students, as a general rule, rated their teacher low in the areas dealing with disposition of uncertainty and/or admonishing. Likewise, most students considered their teacher to be quite content with his or her profession and not necessarily over strict.

Research Question 2: In what major ways, if any, do students' perceptions and teachers' perceptions differ?

As indicated in previous studies, the teachers tend to rate themselves as more student participant-related, whereas students tend to rate their teachers as more teacher directed (Hagborg, 1994). Rickards and Fisher (1998) found that teacher and student perceptions vary greatly from one another and that teachers always give themselves higher ratings than do students. The surveys in the student varied this perception to be justifiable. Teachers in the study tended to consider themselves less strict and admonishing than did their pupils. As Ferguson (1998) noted, students in transition

from elementary grades on through high school perceive changes in the classroom learning environment. These changes, however, are positive and negative. The significance of this is the report that the middle level years are where we tend to "lose" students before they ever enter high school. That would lead us to believe that a teacher's cognizance of his or her students' perception of the classroom learning environment is a valuable tool to be used to keep those students from mentally and/or emotionally "falling through the cracks". Though the students have a great deal of resilience, it may be that an imbalance of a student perceiving the changes in the learning environment as "positive and negative" to that of "negative and negative" is the important factor here.

Research Question 3: In what ways do differences in student perceptions and teacher perceptions of effective teaching and learning have a significant effect on student achievement?

The results and answer to this question is far more complex than originally expected. There does seem to be a correlation of some degree to a student's perception of his or her teacher's perception of effective learning. The problem, however, is a matter of degrees more than a simple yes or no answer. For example, there were some classes that rated their science teacher with a similar score as the teacher's self-reporting in the area of strictness and admonishment. Within each class, however, were typically a few (one to three) students who rated that same teacher very high in the area of strictness and admonishment. Many of these same students had lower grades than their classmates. Unfortunately, at this stage we can only speculate that either: 1) the difference in those students' perception regarding the matter of the learning environment created by that respective teacher were a negative influence on the achievement of those students, or 2) those students lack of success in that learning environment caused these students to see their respective teacher as overly strict and admonishing. Either scenario is viable, but in any case, it can still be argued that the student has moved from being a "positive and negative" perception of the classroom learning environment to that of "negative and negative".

Methodology and Future Research Implications

In retrospect, one gains a great deal of insight not always from what they learn but from what they did not learn. A multitude of questions have arisen attributable to reflection on this study. These include such possible modifications as to incorporate a pre- and post- (or more specifically, a preferred and actual) survey using the QTI. A post-survey was not necessary for the aim of the study, however, this practice may have provided data to additional questions pertaining to whether a students' perception becomes more aligned with that of their teachers' perception as the school year progresses.

Since "perceptions can assist teachers," according to Schunk "by showing how students think, which is useful for teaching" (personal communication, May 6, 1997), then it would be sensible for teachers to consider surveying their own students so as to ascertain their perceptions. This would be particularly helpful using a before and after (e.g., actual and preferred) survey. Such would provide valuable data in which a teacher can modify his or her approach to teaching, even if only for a particular class of students. This is the very heart of authentic research.

Limitations of the Study

It has been said that, "Any methodology used to explore learning environments will produce a landscape that is incomplete and represents only one of the possible portraits which is likely to be appealing and relevant to different stakeholders" (Tobin & Fraser, 1998, p. 623-640). Limitations to this design tend to be centred on the inability to isolate independent variables, thus possibly showing a correlation, but not clearly a "cause and effect". Inferences should be limited to the population being surveyed, namely, that of middle school science classes, and particularly the State of Ohio, though some generalisations may be warranted. In order to increase the generalisability, students from other states or regions, randomly chosen (i.e., probability sample), would need to be included, as well.

Another limitation in this study was that of trying to get schools to accept the offer to participate. Most school districts had specific rules for their faculty not to participate in outside studies, even if conducted for a university. Several district superintendents in close proximity even withheld support or approval for their schools to be surveyed. This may be inconsequential for the probability sampling itself was not

geographically representative of the State of Ohio. Some correspondence noted that their schools would have liked to have participated; however, their respective school districts had standing rules which restrained them from doing so. This factor was not known until after the study concluded, and though was of little consequence to the findings, did make the initial collection cumbersome.

An additional limitation in this study is that of controlling unforseen variables influencing academic achievement. For instance, Rumberger (2002) found that a few studies addressing achievement and student mobility that indicated students who move from one school to another, more than those who do not, have lower academic achievement. In a well-designed study, however, once controls were introduced for the family and academic performance, the associations became largely insignificant. The results now indicated that mobile students came from poorer family and had lower academic performance *before* they were mobile.

This research study is making the assumption that academic performance is influenced by the variance found between that of the students' perception with that of his/her teachers'. Should the data produce very significant results, it would be necessary to then attempt to isolate some of these "unforseen variables" that might be influencing students' academic achievement.

Other possible biases which might have an effect on the data collected might include: 1) how teachers grade; 2) whether the first six/nine weeks is an adequate amount of time to get an accurate scoring (as opposed to whether surveying later in the school year would provide more reliable data); 3) whether the schools being surveyed are representatives of schools throughout other parts of the United States, or other English speaking countries, and, finally; 4) whether the results are applicable only to science and/or middle school classes.

It has been said that, "Any methodology used to explore learning environments will produce a landscape that is incomplete and represents only one of the possible portraits which is likely to be appealing and relevant to different stakeholders" (Tobin & Fraser, 1998, p. 623-640). Maybe this is simply the fruit of research, which

one can now peel into a deeper level of the research problem once trends begin to appear as significant factors.

Ethical Issues

Though invitations were sent to middle level principals in each of the schools randomly chosen from the Ohio school directory, the current attitude regarding possible litigation greatly limited what *could have been done* sample-wise. Even a written guarantee of privacy and confidentiality seems of little significance to the prospective participating teachers or schools. Cooperating science teachers also were informed of the nature of the study and the data being sought. Teachers were provided with permission requests though most of them simply used prior permission sheets completed by the parents of their students. Students were told that their opinions were being sought and that now would be a good time to share some of their feelings about learning. Teachers administered the surveys, as well as participated by completing the teacher's version of the survey. Additional information was requested from the teacher regarding student achievement, namely in the form of a six or nine weeks science grade. The information was to be collected with as little disruption to the normal class routine as possible. Data were collected by the students' science teachers and returned directly to this researcher, eliminating access or handling by other parties. In many cases, teachers assured anonymity either by instructing students to use their Christian name or by assigning students a code. Information was collected from students and teachers, and upon receipt made anonymous. Data were tallied in such a way as to protect each school, and school district's anonymity. The opportunity for feedback was provided to the school's science teacher participating in the study. Personal classroom analyses were generated for respective teachers making such a request.

In conclusion, there is a need to focus on how deeper aspects of teaching and leaning, such as interactions and the domain of perception, affect student achievement beyond the limitations of standardised testing and teaching to the test. Testing and especially standardised testing completely miss all the interaction that takes place in learning. Teachers' must become aware of how students perceive them and their actions in class. Student need to become aware of how they perceive teachers and their actions

and in order to provide an equitable experience for all in the classroom, we must recognize and realise that learning is very multifaceted and very sophisticated experience. This study has shown that students do 1) have specific perceptions about what effective learning is and is not, and 2) they have perceptions about their teachers and their teachers' actions, and 3) these actions tend to hinder them or benefit them, though some are resilient enough to succeed regardless. It appears that constructivism and the present middle level model are seeking to make education more "student-friendly". There is much more we need to examine about this concept we call learning. How foolish for us to think we can measure it all with a test.

Finally, we must consider whether we are doing our students a disservice to place teachers in the class room who are teaching out of field. Those who are experts see the overall picture whereas those who are not tend to see the trees instead of the forest. This has to cause these two types of teachers to be very different in their perception of effective teaching. If student are to learn then teachers must be well-grounded in their discipline so that they are free to think of creative ways to reach students, and to help them achieve.

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APPENDIX A

Pre-study Letter Sent to Principals and Science Teachers

Dear Fellow Science Educator:

My name is Richard NeSmith, and I am a graduate student in the Science and Math Education Centre at Curtin University of Technology in Perth, Australia. I am personally conducting a research project which will fulfil the requirement for my doctoral dissertation. The title of my study is *Students' and Teachers' Perceptions of Effective Teaching and Learning in the Middle Level Science Classroom: The Effects on Student Achievement*.

I would like to invite, and even encourage, you to be a part of our study into the perceptions of middle school students. The purpose of this research is to help us better understand how student perceptions of the classroom environment affect student learning in science. To our knowledge there has not been a study of this nature before, either in Ohio, or elsewhere in the country, which makes it even more important that we enlist your assistance. Your support could provide us with some foundational data to help us better understand the cognition of middle schoolers.

The procedures for assisting are quite simple. First, we ask that you also fill out as survey so as to give us insight on your perception of learning. Once you have approached the end of the first grading period, have your science students fill out the surveys. You might tell them that you are simply seeking their input on learning. Once you have the surveys completed, match them up with the respective students' grade from the first six or nine weeks, whichever is appropriate. This is a vital step and one that we hope you will conduct with precision. Students names and school identify will be removed once received, so as not to violate anyone's right to privacy. No individual student, teacher, or school will be singled out in this study.

Once we have collected the surveys they will be analyzed and a copy of the results will be sent to you. If you would like to have the data for your specific students analyzed, please state this in your return note.

Thank you very much for your time and assistance.

Sincerely,

Richard A. NeSmith
Science & Mathematics Education

ENC: instruction sheet and surveys

APPENDIX B

Recoupment Letter

November 12, 2002

Dear Science Educator:

As we gear up for the coming holidays we all experience the "crunch". I understand that many things begin to pill up on our desk (they tell me my desktop is yellow!). If, however, you would be so kind as to participate in the surveying of your middle school science students and return the surveys to me by **November 30**, I will personally place in the mail to you a free copy of an interactive CD-ROM which I created for my, then, Australian students in Human Biology, entitled, *Human Biology: Entering the 21st Century*.

This reference has over 1,500 useful photos/diagrams/drawings. This work is extensive with over 35,000 internal links and 13,500 internet links. This CD-ROM was written to help my Australian students to master high school anatomy and physiology, and has been so well received that in 2003 Longman Press will be presenting a two volume book set from this material.

I will send this to you free, but you must return your **teacher/student** surveys to me by **November 30th**. This would be a great resource to have in your own professional library and the computer diagrams alone are useful teaching tools.

Sincerely,

Richard A. NeSmith
Science & Mathematics Education

P.S. Once you have placed student grades on the survey, you may feel free to blot out the student participant's names, if that is an issue for you. All information is held in confidence and no person or school will be singled out from the results.

ENC: survey master

APPENDIX C

Directions for Teachers Administering the QTI

Instructions for Administering the Survey by Middle School Science Teachers

1. Photocopy as many of the surveys as you have need. Please encourage other science teachers in the middle school to participate in this state-wide study.
    - We encourage *each science teacher* to survey each of his or her science classes.

2. Have the students complete the blanks at the top of the survey page, such as Student name (or number), Grade level, etc. Please tell them not to fill in the 6 or 9 week grade, that you will do that for them.

3. Explain to students that this is a time to voice their opinions. There are no right or wrong answers, but that they should be serious about their answers.

4. Walk through the first example on page one with the students collectively. Explain the concept of using a continuum (some may have *never* used this format before).

5. Once you feel students understand the concept, have them turn over to page 2 and begin working through the statements.

6. Feel free to clarify any statement that a student may need. As the student fills out a questionnaire, you should fill out one from your own perception of how *you* think you score for each of the 48 statements (only one essay is needed per teacher; not per class). In other words, only fill out one survey on that day.

7. Once collected, please take a few minutes to carefully record students' 6 *or* 9 week grade (whichever applies) on their respective survey form. Accuracy here is very important since this is actually one of our research variables.

8. Collect the surveys (should other science teachers be participating) and return to me. These must be in by **OCTOBER 31** in order to be analyzed collectively.

9. Enclose a note IF you wish to have your batch of student surveys custom analyzed. Otherwise, you will receive a copy of the final collective conclusions on or before the first of the year.

Thank you so much for your cooperation and participation. It really does take a village to train a child. Please let me know if there is anything I can do for you. If you should need to contact me, I am available by e-mail: BioScience_Ed@yahoo.com or phone me at (440) 639-4750. Please note that postage reimbursement will be made upon receipt of your surveys. Thanks again, for your support.

Richard A. NeSmith, Science Education
Lake Erie College
391 W. Washington Street
Painesville, OH 44077

APPENDIX D

Student Questionnaire of Teacher Interaction

SUPPLEMENT

STUDENT QUESTIONNAIRE

This questionnaire asks you to describe the behaviour of your teacher. This is NOT a test. Your opinion is what is wanted.

This questionnaire has 48 sentences about the teacher. For each sentence, circle the number corresponding to your response. For example:

	Never				Always
This teacher expresses himself/herself clearly.	0	1	2	3	4

If you think that your teacher always expresses himself/herself clearly, circle the 4. If you think your teacher never expresses himself/herself clearly, circle the 0. You also can choose the numbers 1, 2 and 3 which are in between. If you want to change your answer, cross it out and circle a new number. Thank you for your cooperation.

Don't forget to write the name of the teacher and other details at the top of the reverse side of this page.

This page is a supplement to a publication entitled *Teacher and Student Relationships in Science and Mathematics Classes* authored by Theo Wubbels and published by the national Key Centre for School Science and Mathematics at Curtin University of Technology.

Teacher's Name _____ Class _____ School _____

	Never Always	Teacher Use
1. This teacher talks enthusiastically about her/his subject.	0 1 2 3 4	Lea
2. This teacher trusts us.	0 1 2 3 4	Und
3. This teacher seems uncertain.	0 1 2 3 4	Unc
4. This teacher gets angry unexpectedly.	0 1 2 3 4	Adm
5. This teacher explains things clearly.	0 1 2 3 4	Lea
6. If we don't agree with this teacher, we can talk about it.	0 1 2 3 4	Und
7. This teacher is hesitant.	0 1 2 3 4	Unc
8. This teacher gets angry quickly.	0 1 2 3 4	Adm
9. This teacher holds our attention.	0 1 2 3 4	Lea
10. This teacher is willing to explain things again.	0 1 2 3 4	Und
11. This teacher acts as if she/he does not know what to do.	0 1 2 3 4	Unc
12. This teacher is too quick to correct us when we break a rule.	0 1 2 3 4	Adm
13. This teacher knows everything that goes on in the classroom.	0 1 2 3 4	Lea
14. If we have something to say, this teacher will listen.	0 1 2 3 4	Und
15. This teacher lets us boss her/him around.	0 1 2 3 4	Unc
16. This teacher is impatient.	0 1 2 3 4	Adm
17. This teacher is a good leader.	0 1 2 3 4	Lea
18. This teacher realises when we don't understand.	0 1 2 3 4	Und
19. This teacher is not sure what to do when we fool around.	0 1 2 3 4	Unc
20. It is easy to pick a fight with this teacher.	0 1 2 3 4	Adm
21. This teacher acts confidently.	0 1 2 3 4	Lea
22. This teacher is patient.	0 1 2 3 4	Und
23. It's easy to make a fool out of this teacher	0 1 2 3 4	Unc
24. This teacher is sarcastic.	0 1 2 3 4	Adm
25. This teacher helps us with our work.	0 1 2 3 4	HFr
26. We can decide some things in this teacher's class.	0 1 2 3 4	SRe
27. This teacher thinks that we cheat.	0 1 2 3 4	Dis
28. This teacher is strict.	0 1 2 3 4	Str
29. This teacher is friendly.	0 1 2 3 4	HFr
30. We can influence this teacher.	0 1 2 3 4	SRe
31. This teacher thinks that we don't know anything.	0 1 2 3 4	Dis
32. We have to be silent in this teacher's class.	0 1 2 3 4	Str
33. This teacher is someone we can depend on.	0 1 2 3 4	HFr
34. This teacher lets us fool around in class.	0 1 2 3 4	SRe
35. This teacher puts us down.	0 1 2 3 4	Dis
36. This teacher's tests are hard.	0 1 2 3 4	Str
37. This teacher has a sense of humour.	0 1 2 3 4	HFr
38. This teacher lets us get away with a lot in class.	0 1 2 3 4	SRe
39. This teacher thinks that we can't do things well.	0 1 2 3 4	Dis
40. This teacher's standards are very high.	0 1 2 3 4	Str
41. This teacher can take a joke.	0 1 2 3 4	HFr
42. This teacher gives us a lot of free time in class.	0 1 2 3 4	SRe
43. This teacher seems dissatisfied.	0 1 2 3 4	Dis
44. This teacher is severe when marking papers.	0 1 2 3 4	Str
45. This teacher's class is pleasant.	0 1 2 3 4	HFr
46. This teacher is lenient.	0 1 2 3 4	SRe
47. This teacher is suspicious.	0 1 2 3 4	Dis
48. We are afraid of this teacher	0 1 2 3 4	Str

APPENDIX E

Interview Protocol

Student-Teacher Perceptions of Classroom Environment
Interview with SCIENCE Students

Student's first name: _____ Date:_____
Teacher: _____ School:_____
Student Grade in Science_____% Gender: m f Age:_____ Grade Level: ___

1. Describe your teacher's classroom behavior? What kind of person is your teacher in the classroom?	
2. Explain your teachers' use of competition and cooperation in the classroom. Which does the teacher use the most?	
3. Would you say that your teacher is more friendly or more helpful? Explain why you think this.	
4. Would you say that your teacher is more strict or more likely to give you responsibilities and privileges? Explain why you feel this way.	
5. When considering your teacher's actions in class, would you say that he/she is satisfied or dissatisfied with being a teacher? What makes you say this?	
6. Would you say that your teacher helps students behave more by making strict rules or by encouraging students to do what is right? Why do you think this?	
7. What kind of practices does your teacher use in class that helps you to learn best? Explain.	

APPENDIX F

Interview Protocol

Student Perceptions of Classroom Environment as Per Interviews

Interview Questions	Participant's Response	
1. Describe your teacher's classroom behavior? What kind of person is your teacher in the classroom?	Student A:	Mrs. N. is a good teacher who usually doesn't tolerate fooling around. She is a good person in the classroom.
	Student B:	Ok sometimes. Nice.
	Student C:	Mrs. G. is really an awesome teacher. She jokes and has fun with us, and gets involved with what we think. She often relates to us by talking about when she was a teen.
	Student D:	Kind; she is understanding.
	Student E:	Mrs. S. is a great teacher. She will explain everything over if we don't understand. She is a fun person to be with and she never puts anyone down. She will let us have fun at an appropriate measure but when we get out of control she will correct us. She is not harsh and she is very understanding. She is always there for you and will never turn you away. If you have a question she makes you feel comfortable asking it. She doesn't make you feel stupid asking it. She is not one of the teachers who think her way is the only way. She always asks of our opinion.
	Student F:	In the classroom my teacher is well-organized relaxed and ready to start each day.
2. Explain your teachers' use of competition and cooperation in the classroom. Which does the teacher use the most?	Student A:	She uses cooperation most. She makes sure everyone pays attention.
	Student B:	Good. Cooperation.
	Student C:	Because we're a more mature class, there is definitely more cooperation because she often lets us do things we like.
	Student D:	Cooperation, she uses to help learn.

Interview Questions	Participant's Response	
	Student E:	Mrs. S. encourages us to cooperate more in the class room. She will have us work in pairs to figure out problems and she will never say something like how come you're not as smart as this person. She has always taught us to learn from our mistakes. If one of my friends doesn't get something I will help her out, rather than worry if she is going to do better on the test than I am.
	Student F:	The only way my teacher is competitive is when we play review games before tests. Most of the time he is cooperative.
3. Would you say that your teacher is more friendly or more helpful? Explain why you think this.	Student A:	She is more helpful because although she can be friendly, she explains things thoroughly.
	Student B:	Helpful. Helps when you ask for it.
	Student C:	I would say both because she helps us a lot in friendly ways, which helps us understand what we don't.
	Student D:	Both, uses friendliness to show you can go to her for help.
	Student E:	I think Mrs. S. is more helpful. She is nice but definitely more helpful. She will always be there to help all of us and she does it in a serious manner. She realizes that our #1 goal is to live a good life and during her teaching she focuses more on that than her own goals.
	Student F:	My teacher is both because he walks with a smile and he does help us out. He always asks hows your day or how have you been going.
4. Would you say that your teacher is more strict or more likely to give you responsibilities and privileges? Explain why you feel this way.	Student A:	Sometimes she can be strict, but she mostly gives us responsibilities and privileges like homework passes.
	Student B:	Responsibilities & privileges.
	Student C:	She definitely is not strict at all, and does give us our own responsibilities, which makes the class much more easy going.
	Student D:	Gives responsibility and privileges. She shows trust.

Interview Questions	Participant's Response	
	Student E:	Mrs. S. is more likely to give us privileges because she trusts us and through our behaviour it shows her she can. If we keep her trust she will keep giving us responsibilities and privileges. If we lose it she may have to go to being strict.
	Student F:	Mr. M. in all ways is not strict. For example in study hall if we were good all week we could watch a movie on Friday.
5. When considering your teacher's actions in class, would you say that he/she is satisfied or dissatisfied with being a teacher? What makes you say this?	Student A:	She is satisfied. You can tell she likes being a teacher even if she gets frustrated sometimes.
	Student B:	Satisfied. Seems like he likes his job.
	Student C:	I would say Mrs. G. LOVES being a teacher! She talks and relates to us and seems really happy with our work.
	Student D:	Satisfied, you can tell she likes what she does.
	Student E:	I think Mrs. S. is very happy with being a teacher. She comes to work everyday with a smile on her face and is very enthusiastic in her teaching. You can tell she loves her job and she always reflects on how happy she is teaching. She makes everyday a good day because she is never depressed. If she is she will never take her bad day out on us.
	Student F:	He seems satisfied with being a teacher because you can tell he has spent time on making a lesson plan.
6. Would you say that your teacher helps students behave more by making strict rules or by encouraging students to do what is right? Why do you think this?	Student A:	Honestly, it is probably more strict rules because she does give chances, but she's got a lot of rules for us.
	Student B:	Do what is right.
	Student C:	She's not strict, so she encourages us to do what's right & what we feel is right.
	Student D:	Encourages us to do what is right.

Interview Questions	Participant's Response	
	Student E:	I think Mrs. S. helps us by encouraging us to do what is right. If we do something wrong she will correct us, tell us what we are doing wrong, help us fix our problem like talking, knuckle cracking, etc., and she will praise us when we do what is right.
	Student F:	He is encouraging because if we forget our book or a folder he lets us go get it in beginning of class.
7. What kind of practices does your teacher use in class that helps you to learn best? Explain.	Student A:	She always explains stuff real clearly, by giving us an intro on the chapter or explaining a project as thorough as she can.
	Student B:	Demonstration.
	Student C:	Group work RULES! We do group and interacting and communicating helps a lot of us learn best.
	Student D:	Shows a lot of examples on the board, and will work one on one.
	Student E:	The practices that she uses that helps us to learn best is that she adjusts all her teaching skills to our learning styles. Some of us have to be sight taught. Others of us have to be read to and then we get it. She does demonstrations of what she is trying to teach, through experiments. She will do anything to help us grasp the concept that she is teaching.
	Student F:	My teacher does a lot of group work and visual aids. One time we got to use a slinky to imitate earthquake waves.

APPENDIX G

Interview Protocol

Teacher Perceptions of Classroom Environment as Per Interviews

Interview Questions	Participant's Response	
1. Describe your teacher's classroom behavior? What kind of person is your teacher in the classroom?	Teacher A:	Structured teachers likes to establish an environment in which children are comfortable, a little more formal; material displayed in a variety of ways.
	Teacher B:	Orderly, controlled, some humor, some
	Teacher C:	I like the atmosphere in my room to be relaxed, so that the students feel comfortable enough to ask me questions or make comments. I believe I have a good sense of humor & I like to joke around to an extent.
	Teacher D:	My goal is to treat the students as individuals, provide them with a positive atmosphere and enhance their knowledge.
	Teacher E:	I am an organized teacher. I think students feel best when we have an established routine. I have certain expectations and the students understand their required behavior.
	Teacher F:	I try to conduct myself in a professional manner, using a blend of humor, knowledge, and storytelling during instruction. If the class is interesting, students will learn.
2. Explain your teachers' use of competition and cooperation in the classroom. Which does the teacher use the most?	Teacher A:	Cooperation is the only thing emphasized; competition may arise from students against students; test results for students.
	Teacher B:	Very little competition. Has meaningful effect on grade. Cooperative as much as possible. Cooperative.
	Teacher C:	I use cooperation much more than competition. I do a lot of group work & cooperative learning activities. The students will always get the chance to be competitive when it is time for individual tests.

Interview Questions	Participant's Response	
	Teacher D:	Sometimes I have students work together to help each other. Competition is a bit trickier as it will motivate some but discourage others.
	Teacher E:	Students work in the lab in small groups. All students are responsible for the final responses to group projects.
	Teacher F:	I believe that my students need the opportunity to work in cooperative groups, since most jobs require this ability. I do not foster a sense of competition in my classroom.
3. Would you say that your teacher is more friendly or more helpful? Explain why you think this.	Teacher A:	Helpful b/c I am the teacher and not their friend.
	Teacher B:	Helpful goal is to help, not be their friend.
	Teacher C:	I think both. I am a friendly person in general but I will always help any student that asks for it or needs it.
	Teacher D:	I don't see how this is a choice.
	Teacher E:	I try very hard to seek out the student who is reluctant to ask questions. I believe all students can learn but not all learn the same way.
	Teacher F:	I am a nice and friendly teacher who also tries to be helpful. Our schedule at the middle school does not give teachers much time to be as helpful as I would like.
4. Would you say that your teacher is more strict or more likely to give you responsibilities and privileges? Explain why you feel this way.	Teacher A:	In between b/c of the role that I sees the MS Teacher to be; I want students to learn to be self sufficient; they are learning in "real little steps."
	Teacher B:	Use both. In awarding behavior and more strict if misbehaving. Have to have guidelines.
	Teacher C:	The latter. I choose to let the students prove to me how responsible they are through how much freedom they can handle. This varies among classes. After a few weeks, I can usually tell how mature & responsible the different groups are.
	Teacher D:	Teach students responsibilities.

Interview Questions	Participant's Response	
	Teacher E:	I am more likely to give responsibilities. Learning involves cooperation.
	Teacher F:	Once the students prove to me that they can act in a mature manner, then I grant them responsibilities and privileges within cooperative learning groups.
5. When considering your teacher's actions in class, would you say that he/she is satisfied or dissatisfied with being a teacher? What makes you say this?	Teacher A:	Students would perceive me to be satisfied as a teacher b/c I am involved in many activities, plus I tries to joke around with them and smile as much as possible.
	Teacher B:	Never satisfied, believes he can always improve. Dissatisfied (lack of teacher authority).
	Teacher C:	Satisfied – though my answer would have been different 4 years ago. With experience & time the job gets easier & more enjoyable. Also, having higher level students or students who are friendly & willing to work makes the job better also.
	Teacher D:	Satisfied.
	Teacher E:	I love what I do. Other than being a stay at home mom, nothing could be more fulfilling.
	Teacher F:	Students can tell very quickly if a teacher enjoys his/her job or is working just for a pay check. There is not a doubt in my mind that I am a teacher because I enjoy helping children.
6. Would you say that your teacher helps students behave more by making strict rules or by encouraging students to do what is right? Why do you think this?	Teacher A:	The students make their own rules at the beginning of the year; I say its encouraging b/c I take away bonus points for misbehavior instead of serious discipline.
	Teacher B:	Do both. You have to have rules and have to encourage to help them reach their goals.
	Teacher C:	The latter, however sometimes strict rules are needed in the classroom. You can't have a room that is out of control b/c nobody will learn in that environment.
	Teacher D:	Encouraging students to do what is right in a framework of Basic Rules.

Interview Questions	Participant's Response	
	Teacher E:	I am a strong believer in person responsibility.
	Teacher F:	Although rules are necessary for a class to run smoothly, I try to help students to focus on the choices they are making and to improve those choices.
7. What kind of practices does your teacher use in class that helps you to learn best? Explain.	Teacher A:	Vary the way I teach by using different methods in the way students learn and how they provide information back.
	Teacher B:	Variety of stimuli. Write, hear, read. When possible use hands on.
	Teacher C:	Activities & group work. Some kids learn best w/ these strategies. Some students like individual work such as notes/lecture. I try to do a bit of both.
	Teacher D:	Practice. Individual attention.
	Teacher E:	I talk to the students about individual learning styles and help them discover what their personal style is so they can maximize their educational experiences.
	Teacher F:	I believe that good teachers use all kinds of methods to deliver instruction. I like to use cooperative learning groups and computer technology in my lessons.

APPENDIX H

Comparison of Student-Teacher Comments for Item 7 on the Interview Protocol with the QTI Scores for the 8 Sectors

Item #7	Teachers' Response		QTI Scores		Students' Response		QTI Scores	
7. What kind of practices does your teacher use in class that helps you to learn best? Explain.	A:	Vary the way she teaches by using different methods in the way students learn and how they provide information back.	Lea Und Unc Adm HFr SRe Dis Str	21 19 0 4 23 7 0 14	A:	She always explains stuff real clearly, by giving us an intro on the chapter of explaining a project as thorough as she can.	Lea Und Unc Adm HFr SRe Dis Str Grade:	21 21 1 5 20 12 5 8 95.4%
	B:	Variety of stimuli. Write, hear, read. When possible he uses hands on.	Lea Und Unc Adm HFr SRe Dis Str	17 18 5 8 18 10 9 13	B:	Demonstration	Lea Und Unc Adm HFr SRe Dis Str Grade:	19 19 7 10 17 12 4 7 77%
	C:	Activities & group work. Some kids learning best w/ these strategies. Some students like individual work such as notes/lecture. I try to do a bit of both.	Lea Und Unc Adm HFr SRe Dis Str	21 19 5 3 24 14 1 5	C:	Group work RULES! We do group and interacting and communicating helps a lot of us learn best.	Lea Und Unc Adm HFr SRe Dis Str Grade:	24 24 1 1 24 17 0 4 85%
	D:	Practice. Individual attention.	Lea Und Unc Adm HFr SRe Dis Str	22 21 0 4 20 10 1 11	D:	Shows a lot of examples on the board, and will work one on one.	Lea Und Unc Adm HFr SRe Dis Str Grade:	19 20 0 6 23 10 4 9 74%

Item #7	Teachers' Response		QTI Scores		Students' Response		QTI Scores	
	E:	I talk to the students about individual learning styles and help them discover what their personal style is so they can maximise their educational experiences.	Lea Und Unc Adm HFr SRe Dis Str	21 23 1 0 23 12 0 2	E:	The practices that she uses that help us to learn best if that she adjusts all of her teaching skills to our learning styles. Some of us have to be sight taught. Others of us have to be read to and then we get it. She does demonstrations of what she is trying to teach, through experiments. She will do anything to help us grasp the concept that she is teaching.	Lea Und Unc Adm HFr SRe Dis Str Grade:	23 23 0 0 24 10 0 9 96%
	F:	I believe that good teachers use all kinds of methods to deliver instruction. I like to use cooperative learning groups and computer technology in my lessons.	Lea Und Unc Adm HFr SRe Dis Str	21 21 2 4 21 9 1 9	F:	My teacher does a lot of group work and visual aids. One time we got to use a slinky to imitate earthquake waves.	Lea Und Unc Adm HFr SRe Dis Str Grade:	18 22 9 5 22 11 4 10 93%

APPENDIX I

Descriptives by Teacher

Teacher A	N	Minimum	Maximum	Mean	Std. Deviation
Lea	127	1.83	4.00	3.2178	.47444
Und	127	1.33	4.00	3.1192	.55334
Unc	127	.00	1.83	.4546	.45518
Adm	127	.00	2.67	.6184	.50683
HFr	127	.83	4.00	3.0034	.64548
SRE	127	.33	3.17	1.7294	.53644
Dis	127	.00	2.50	.4373	.47186
Str	127	.00	3.50	1.4984	.60690
Valid N (list wise)	127				

Teacher B	N	Minimum	Maximum	Mean	Std. Deviation
Lea	23	1.83	4.00	3.2826	.50361
Und	23	2.17	4.00	3.6058	.40684
Unc	23	.00	2.50	.7000	.64385
Adm	23	.00	2.17	.4420	.57210
HFr	23	3.00	4.00	3.6667	.31382
SRE	23	1.33	3.83	2.5652	.61080
Dis	23	.00	2.33	.5290	.68101
Str	23	.00	3.33	1.3986	.78454
Valid N (list wise)	23				

Teacher C	N	Minimum	Maximum	Mean	Std. Deviation
Lea	55	1.83	4.00	3.3673	.49895
Und	55	1.50	4.00	3.2758	.56676
Unc	55	.00	2.17	.4982	.47351
Adm	55	.00	3.67	1.3376	.69223
HFr	55	1.50	4.00	3.3788	.64026
SRE	55	.17	3.17	1.8467	.58308
Dis	55	.00	3.33	.8545	.65660
Str	55	.83	3.83	1.8455	.67221
Valid N (list wise)	55				

Teacher D	N	Minimum	Maximum	Mean	Std. Deviation
Lea	16	2.17	4.00	3.2708	.57373
Und	16	2.50	4.00	3.3958	.45896
Unc	16	.00	2.20	.9687	.83369
Adm	16	.17	2.50	1.1854	.62598
HFr	16	2.17	4.00	3.2979	.46115
SRE	16	.50	3.33	2.1771	.70571
Dis	16	.00	3.00	.9062	.78166
Str	16	.83	2.83	1.6615	.65720
Valid N (list wise)	16				

Teacher E	N	Minimum	Maximum	Mean	Std. Deviation
Lea	59	2.33	4.00	3.3486	.41098
Und	59	.67	4.00	3.5395	.51634
Unc	59	.00	3.17	.7367	.62914
Adm	59	.00	3.50	.8356	.65580
HFr	59	2.00	4.00	3.5249	.44630
SRE	59	.50	3.17	1.9537	.52759
Dis	59	.00	2.67	.7395	.54077
Str	59	.17	3.17	1.5136	.56205
Valid N (list wise)	59				

Teacher F	N	Minimum	Maximum	Mean	Std. Deviation
Lea	25	2.67	4.00	3.6600	.34521
Und	25	3.00	4.00	3.5933	.33706
Unc	25	.00	2.50	.4573	.56695
Adm	25	.00	1.17	.5293	.39173
HFr	25	3.00	4.00	3.7387	.30424
SRE	25	.83	3.50	1.9840	.67551
Dis	25	.00	1.17	.2533	.34061
Str	25	.50	2.00	1.2600	.46168
Valid N (list wise)	25				

Teacher G	N	Minimum	Maximum	Mean	Std. Deviation
Lea	18	2.67	4.00	3.7130	.35149
Und	18	3.00	4.00	3.4907	.33074
Unc	18	.00	1.00	.3111	.31890
Adm	18	.00	1.17	.5130	.44694
HFr	18	3.00	4.00	3.7019	.31006
SRE	18	1.17	2.80	1.8852	.46078
Dis	18	.00	.83	.1944	.28151
Str	18	.67	2.00	1.3519	.47102
Valid N (list wise)	18				

Teacher H	N	Minimum	Maximum	Mean	Std. Deviation
Lea	21	2.33	4.00	3.5397	.44380
Und	21	2.83	4.00	3.5317	.40352
Unc	21	.00	1.67	.4286	.43961
Adm	21	.00	2.50	1.0302.	.65548
HFr	21	2.50	4.00	3.3921	.49799
SRE	21	1.00	2.67	1.6825	.45615
Dis	21	.00	2.00	.7619	.58588
Str	21	.50	3.33	1.4365	.60433
Valid N (list wise)	21				

Teacher I	N	Minimum	Maximum	Mean	Std. Deviation
Lea	19	1.33	3.83	3.2544	.58100
Und	19	2.33	4.00	3.5789	.40585
Unc	19	.00	2.00	.5140	.60505
Adm	19	.00	1.33	.3246	.36630
HFr	19	1.50	4.00	3.5526	.61376
SRE	19	.67	2.17	1.4035	.40944
Dis	19	.00	1.17	.2982	.35823
Str	19	.60	2.33	1.4702	.51001
Valid N (list wise)	19				

Teacher J	N	Minimum	Maximum	Mean	Std. Deviation
Lea	24	2.00	4.00	3.186	.56662
Und	24	1.83	4.00	3.1319	.68097
Unc	24	.00	1.83	.4583	.62021
Adm	24	.00	3.17	1.0764	.68097
HFr	24	1.50	4.00	3.2569	.67024
SRE	24	.67	3.33	1.7083	.69374
Dis	24	.00	2.17	.6806	.65186
Str	24	.50	2.83	1.5625	.58938
Valid N (list wise)	24				

Teacher K	N	Minimum	Maximum	Mean	Std. Deviation
Lea	23	.67	4.00	3.0362	.90028
Und	23	1.00	3.67	2.7000	.83442
Unc	23	.00	3.80	.6681	.75508
Adm	23	.33	3.17	1.2449	.86612
HFr	23	.17	3.83	2.4493	.98657
SRE	23	.33	3.17	1.5949	.76573
Dis	23	.00	3.20	1.1826	.97270
Str	23	1.17	3.83	2.2899	.73385
Valid N (list wise)	23				

Teacher L	N	Minimum	Maximum	Mean	Std. Deviation
Lea	23	2.33	4.00	3.1304	.44083
Und	23	1.67	4.00	3.1797	.65742
Unc	23	.00	2.00	.8058	.57976
Adm	23	.00	3.00	1.0507	.70028
HFr	23	2.17	4.00	3.4058	.53140
SRE	23	.67	3.00	1.7986	.73584
Dis	23	.00	2.50	.7594	.63317
Str	23	.33	3.00	1.1652	.59768
Valid N (list wise)	23				

Descriptives by Class

Class 1	N	Minimum	Maximum	Mean	Std. Deviation
Lea	21	2.33	4.00	3.5397	.44380
Und	21	2.83	4.00	3.5317	.40352
Unc	21	.00	1.67	.4286	.43961
Adm	21	.00	2.50	1.0302	.65548
HFr	21	2.50	4.00	3.3921	.49799
SRE	21	1.00	2.67	1.6825	.45615
Dis	21	.00	2.00	.7619	.58588
Str	21	.50	3.33	1.4365	.60433
Valid N (list wise)	21				

Class 2	N	Minimum	Maximum	Mean	Std. Deviation
Lea	200	1.83	4.00	3.3035	.49153
Und	200	1.33	4.00	3.1957	.55114
Unc	200	.00	2.17	.4537	.45067
Adm	200	.00	3.67	.8067	.64658
HFr	200	.83	4.00	3.1695	.66227
SRE	200	.17	3.17	1.7757	.54447
Dis	200	.00	3.33	.5302	.55635
Str	200	.00	3.83	1.5807	.63499
Valid N (list wise)	200				

Class 3	N	Minimum	Maximum	Mean	Std. Deviation
Lea	89	.67	4.00	3.1461	.64050
Und	89	1.00	4.00	3.1281	.72766
Unc	89	.00	3.80	.6142	.64895
Adm	89	.00	3.17	.9528	.75695
HFr	89	.17	4.00	3.1498	.83183
SRE	89	.33	3.33	1.6373	.68006
Dis	89	.00	3.20	.7491	.75391
Str	89	.33	3.83	1.6281	.73821
Valid N (list wise)	89				

Class 4	N	Minimum	Maximum	Mean	Std. Deviation
Lea	84	2.33	4.00	3.4413	.41593
Und	84	.67	4.00	3.5556	.46879
Unc	84	.00	3.17	.6536	.62133
Adm	84	.00	3.50	.7444	.60394
HFr	84	2.00	4.00	3.5885	.41907
SRE	84	.50	3.50	1.9627	.57153
Dis	84	.00	2.67	.5948	.53657
Str	84	.17	3.17	1.4381	.54405
Valid N (list wise)	84				

Class 5	N	Minimum	Maximum	Mean	Std. Deviation
Lea	39	1.83	4.00	3.2778	.52612
Und	39	2.17	4.00	3.5197	.43580
Unc	39	.00	2.50	.8103	.72958
Adm	39	.00	2.50	.7470	.69382
HFr	39	2.17	4.00	3.5154	.41800
SRE	39	.50	3.83	2.4060	.67081
Dis	39	.00	3.00	.6838	.73826
Str	39	.00	3.33	1.5064	.73756
Valid N (list wise)	39				

Descriptives for Students Whole Sample (n = 433)

	N	Minimum	Maximum	Mean	Std. Deviation
Lea	433	.67	4.00	3.3070	.52261
Und	433	.67	4.00	3.2971	.58740
Unc	433	.00	3.80	.5564	.56860
Adm	433	.00	3.67	.8301	.67005
HFr	433	.17	4.00	3.2887	.66089
SRE	433	.17	3.83	1.8358	.62142
Dis	433	.00	3.33	.6128	.62137
Str	433	.00	3.83	1.5491	.65061
Valid N (list wise)	433				

Scale of 0-4

Descriptives for Teachers (n = 12)

	N	Minimum	Maximum	Mean	Std. Deviation
Lea	12	2.50	3.67	3.2361	.45203
Und	12	2.50	3.83	3.2222	.47319
Unc	12	.00	1.17	.5278	.42541
Adm	12	.00	1.33	.7917	.38353
HFr	12	2.50	4.00	3.4722	.42541
SRE	12	1.17	2.83	1.7222	.47849
Dis	12	.17	1.67	.5833	.53418
Str	12	1.33	2.33	1.8056	.35415
Valid N (list wise)	12				