

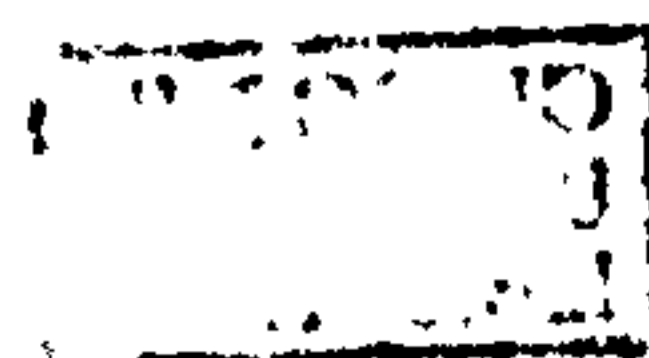
**Prescription for change: medical undergraduates'
perceptions of learning in traditional and problem-based
courses**

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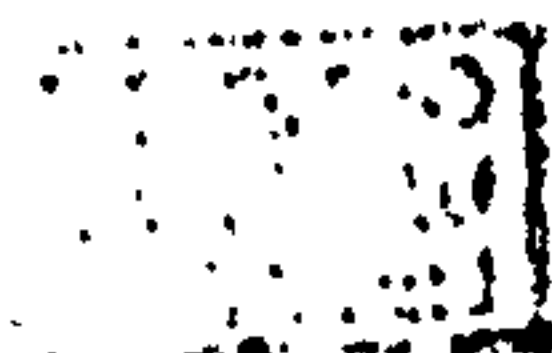
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Abstract

Recent recommendations for radical change in medical education have proposed that undergraduate courses need to reduce the factual 'load' on students, encouraging instead critical thinking skills (e.g., independent enquiry, evaluation of information) necessary for self-directed lifelong learning. This study explored the perceptions of learning of two cohorts of medical students at Glasgow University, one following a traditional lecture-based course, the other its successor, a problem-based curriculum, specifically designed in response to the GMC's call for change. The aims of the study were to determine *i)* the extent to which students in both courses changed their perceptions, largely during first year, with regard to the student's role, the role of staff, the student's task in exam/assessment situations, and the nature of knowledge, in ways that might be more consistent with a critical, independent approach to learning; *ii)* the extent to which students in the traditional and problem-based courses reported different views of their learning experience and different degrees of change, if any, and *iii)* whether a critical independent approach to learning was associated with personality factors. Data were collected from students during their first two undergraduate years, by way of self-report questionnaires and individual interviews. After an apparently similar starting-point, many significant differences between the two cohorts, in their perceptions of learning, became evident as early as first term and appeared to have increased by the end of first year. There was also a significant positive correlation between the personality factor, *openness to experience*, and a critical independent approach to learning for students in both courses. Generally, it seems that the intentions of the course are being fulfilled, in terms of the above

features of the learning environment, but with a few reservations on the part of students, mainly concerning extent of in-depth knowledge required, degree of staff involvement, and how best to self-monitor without regular exams.

CONTENTS

	<i>Page</i>
Abstract	
Acknowledgements	
Chapter 1 Introduction	1
Chapter 2 Theoretical and empirical context of the study	6
2.1 Introduction	6
2.2 The nature of problem-based learning in medical education	7
2.3 Educational goals of problem-based learning and lecture-based instruction	11
2.4 Theoretical underpinnings of problem-based learning in medicine	13
2.5 Relevant research findings from studies of students' perceptions of their learning experience	15
2.5.1 Students' perceptions of their learning environment	15
2.5.2 Students' perceptions of key features of their medical courses	19
2.5.3 Students' perceptions about approaches to studying and the academic process	27
2.5.4 Methodological issues in research into problem-based learning in medical education	31
2.6 Research into the personality traits of medical undergraduates	34

2.7	Theoretical bases of the two questionnaires used in the research: <i>i)</i> Perry's scheme of cognitive and ethical development	41
2.8	Theoretical bases of the two questionnaires used in the in the research: <i>ii)</i> Costa and McCrae's Five-Factor Theory of Personality	53
2.9	Summary	58
Chapter 3	Methodology used in the research study	61
3.1	General design of the study	61
3.2	Procedure	65
3.3	Measuring instruments	66
3.3.1	Questionnaire about students' perceptions of learning	67
3.3.2	Semi-structured interview	74
3.3.3	The NEO Five-Factor Inventory (<i>NEO-FFI</i>), Form S (Costa and McCrae, 1991)	76
Chapter 4	Analyses of the learning perceptions questionnaire I Cohort response patterns: sentence stems	81
4.1	Introduction	81
4.2	Response rates for the learning perceptions questionnaire	82
4.3	Responses to the sentence stems: between-groups and within-groups comparisons	83
4.4	Between-groups comparisons of perceptions reported <i>i)</i> retrospectively <i>ii)</i> first term <i>iii)</i> third term in first year	87
4.4.1	'Pre-university' perceptions	87
4.4.2	Perceptions at the beginning of Year 1 (Term 1)	93
4.4.3	Perceptions at the end of Year 1 (Term 3)	98

4.5	Within-groups comparisons of perceptions reported at the beginning and end of first year	105
4.5.1	Summary of within-group comparisons	107
Chapter 5	Analyses of the learning perceptions questionnaire II	109
	Change patterns in individual responses: sentence stems	
5.1	Introduction	109
5.2	Extent of changes in individual responses by students in the traditional and PBL courses	110
5.2.1	Students in the traditional course: general patterns of change in individuals' responses	113
5.2.2	Students in the PBL: general patterns of change in individuals' responses	116
5.3	Summary of individual changes in response to the four sentence stems	119
5.4	Extent of changes in individual responses: comparisons of students in the traditional and PBL courses	120
5.4.1	Summary of comparisons of students in the traditional and PBL courses: changes in individual responses to the four sentence stems	125
Chapter 6	Analyses of the learning perceptions questionnaire III	128
	Change patterns in individual responses: Likert-type statements	
6.1	Introduction	128
6.2	Changes in response to 'A' statements during first year: students in the traditional and problem-based courses	131
6.3	Changes in response to 'C' statements during first year: students in the traditional and problem-based courses	139

6.4	Changes in response to 'B' statements during first year: students in the traditional and problem-based courses	145
6.5	Summary of changes in response to the Likert-type statements during first year: comparisons of students in the traditional and problem-based courses	153
Chapter 7	Analyses of personality measures	155
7.1	Introduction	155
7.2	Scores on the dimensions of the <i>NEO Five-Factor Inventory</i>	158
7.2.1	Further analyses of scores of <i>agreeableness</i> , <i>neuroticism</i> and <i>conscientiousness</i> : comparison of male and female students in each course	160
7.2.2	Further analyses of scores of <i>agreeableness</i> , <i>neuroticism</i> and <i>conscientiousness</i> : comparison of male and female students across courses	163
7.3	Correlations between students' personality traits and their perceptions of learning	165
7.3.1	Introduction	165
7.3.2	Rationale for the allocation of 'distance from A' scores to 'Agree', 'Disagree' and 'Neutral responses	166
7.3.3	Results of correlational analyses of personality scores and 'distance from A' scores	173
7.4	Summary of findings about students' personality scores	183
Chapter 8	Analysis of interviews I	186
	Students' motivation, confidence of success and perceptions of difficulties in undergraduate study	
8.1	Introduction	186
8.2	Interview participants	188

8.3	Level of student motivation during the first two years of the medical course	192
8.3.1	Interviewees in the traditional course	193
8.3.2	Interviewees in the PBL course	195
8.3.3	Others' views of the students' medical course	198
8.3.4	Summary of students' changes in motivation during their first two undergraduate years	204
8.4	Initial reactions of the PBL interviewees to the experience of problem-based learning	206
8.4.1	Awareness of changes in the undergraduate course	206
8.4.2	Responses to the PBL experience	207
8.4.3	Summary of students' initial reactions to the PBL experience	210
8.5	Students' levels of confidence in passing at different stages of their medical course	210
8.5.1	Confidence levels at the beginning of first and second years: students in the traditional course	211
8.5.2	Confidence levels at the beginning of first and second years: students in the PBL course	212
8.5.3	Confidence levels in relation to completion of the medical course: students in both the traditional and PBL courses	214
8.5.4	Summary of students' reported levels of confidence in relation to different stages of the medical course	216
8.6	Those aspects of undergraduate study considered most difficult	217
8.7	Students' perceptions of volume of work	220
8.7.1	Perceptions of volume of work: students in the PBL course	220
8.7.2	Perceptions of volume of work: students in the traditional course	222
8.7.3	Summary of students' perceptions of volume of work	225

Chapter 9	Analysis of interviews II	226
	Students' perceptions of key features of course and approaches to studying	
9.1	Introduction	226
9.2	Students' perceptions of specific characteristics of the two medical curricula	227
9.3	Approaches to studying used by students	234
9.3.1	Students' use of specific approaches to studying	235
9.3.2	Interviewees in the traditional course	239
9.3.3	Interviewees in the PBL course	244
9.3.4	'Re-writing' of notes	246
9.3.5	Summary of students' approaches to studying	249
9.4	Students' explanations of their C→A or A→C shift in questionnaire response during first year	251
9.4.1	Interviewees in both courses who changed from 'A' to 'C'	252
9.4.2	Interviewees in both courses who changed from 'C' to 'A'	258
9.4.3	Summary of students' explanations of their change responses during first year	261
9.5	Experience of being a medical undergraduate: unstructured final comments made by interviewees	262
9.5.1	Comments made by interviewees in the PBL course	262
9.5.2	Comments made by interviewees in the traditional course	267
9.5.3	Summary of interviewees' unstructured final comments	270

Chapter 10	Reliability and validity of the learning perceptions questionnaire	272
10.1	Introduction	272
10.2	Likert-type statements: consistency of students' responses to 'A', 'B' and 'C'-type statements	273
10.3	Sentence stems and Likert-type statements: consistency of students' responses	277
Chapter 11	Summary of research results	292
11.1	Introduction	292
11.2	Perceptions of learning reported by students in the traditional and problem-based courses	292
11.2.1	Differences between the two cohorts at three points in time	292
11.2.2	Separate within-group comparisons across time	295
11.2.3	Patterns of change in individuals' perceptions during first year in traditional and PBL courses	297
11.3	Data from individual interviews	301
11.4	Correlations between students' perceptions of learning and personality traits	306
Chapter 12	Discussion of research results	308
12.1	Introduction	308
12.2	Students' general reactions to their learning environment	309
12.3	Perceptions of their learning experience reported by students in the two curricula	311
12.4	Perceptions of exams/assessments by students in both curricula	328

12.5	Positive correlations between 'C' perspectives and personality factors, <i>openness to experience</i> and <i>agreeableness</i>	334
12.6	Conclusion	341
12.6.1	Claims that can be made on the basis of this study	341
12.6.2	Main conclusions from the research	345
References		353
Appendices		366

CHAPTER 1

INTRODUCTION

In October 1996, the University of Glasgow's Faculty of Medicine embarked on a completely new undergraduate course. The new curriculum represented a radically different approach to undergraduate medical education from the one in which first year students had enrolled previously. It embodied a fundamental change from a lecturer-centred, discipline-based course to a student-centred, problem-based one.

The new course was designed in response to the Report, *Tomorrow's Doctors*, produced by the General Medical Council in 1993. The Report emphasised the need to reduce the factual load in medical courses and to facilitate students' self-directed learning skills in preparation for their continuing professional education after graduation (Lowry, 1992). This represented a major shift in emphasis from the absorbing of medical facts to the acquiring of not only knowledge but also the attitudes and skills now thought to be desirable and necessary for a doctor in the 21st century. According to the Report:

'Learning through curiosity, the exploration of knowledge, and the critical evaluation of evidence should be promoted and should ensure

a capacity for self-education; the undergraduate course should be seen as the first stage in the continuum of medical education that extends throughout professional life.'

(GMC, 1993: 23)

In line with the GMC's recommendations, the new course at Glasgow comprises four components: *i)* a 'core' curriculum, in which the aim is to integrate fully the basic sciences with clinical topics; *ii)* a further clinical core for case-work; *iii)* vocational studies, which provide opportunities for patient contact at an early stage in the curriculum, debates about ethical issues, and training in communication skills; and *iv)* special study modules, which provide students with the chance to pursue subjects of personal interest, for example, the study of a foreign language. Underpinning the curriculum is the philosophy of self-directed learning advocated in the GMC's 1993 Report. This is implemented through problem-based learning, which is practised across the integrated core. There are very few lectures and 50% of the students' timetable is for personal study (Moffat, Ross and Morrison, 1998). Students work in groups of eight and direct their own learning in six five-week blocks during the year. They are presented with a 'trigger', or prompt, in the form of a scenario, in response to which the students identify what they do or do not know, and use a variety of resources to investigate a set of objectives, for example, the distinction among 'health', 'illness' and 'disease'. Problem-based learning in such group settings,

therefore, is the major method in which students acquire the content of the curriculum.

Rather than changes being phased into the existing medical course, this radically altered curriculum completely superseded its predecessor. In October 1995, the last group of undergraduates enrolled in their first year in the 'old', or 'traditional', course. In October 1996, the first group of students embarked on their first year in the new course characterised by problem-based learning (PBL).

Rosenthal and Ogden (1998) argued that:

'... proponents for change in medical education appear to have given little consideration to the attitudes of students themselves either to their present curricula or to the proposed changes.'

(1998: 127)

The timing of the implementation of changes in the Glasgow curriculum allowed for exactly this possibility. The situation provided a unique opportunity for a study of perceptions of the learning experience from the perspectives of these two different cohorts, not only to trace possible changes as the students progressed, in the initial undergraduate year especially, but also to compare these perceptions as the two cohorts engaged with such radically different curricula and to investigate possible

relationships between kinds of perceptions and students' personality dimensions. The following five research hypotheses were proposed, to take account of *i)* recommendations for a new approach to medical education, summed up in the earlier quotation about 'learning' from *Tomorrow's Doctors* and *ii)* psychological literature suggesting that critical independent thinking of the kind considered desirable in new medical graduates represents 'higher' stages or levels in the cognitive and ethical development of an individual.

1. At the end of the first year, compared with the beginning, a higher proportion of students in both the traditional and PBL courses will report perceptions of their learning experience thought to be associated with a critical independent approach to learning.
2. In comparison with students in the traditional course, at the end of first year, a higher proportion of the students in the PBL course will report perceptions of their learning experience thought to be associated with a critical independent approach to learning.
3. In comparison with students in the traditional course, at the end of first year, a higher proportion of the students in the PBL course will have moved 'forwards' in their perceptions of their learning experience to those thought to be associated with a critical independent approach to learning.

4. For students in both courses, there will be a positive correlation between the personality dimension, *openness to experience*, and perceptions of the learning experience thought to be associated with a critical independent approach to learning.

5. For students in both courses, there will be a negative correlation between the personality dimension, *agreeableness*, and perceptions of the learning experience thought to be associated with a critical independent approach to learning.

CHAPTER 2

THEORETICAL AND EMPIRICAL CONTEXT OF THE STUDY

2.1 Introduction

The aim of this Chapter is to set the context of the study in terms of relevant theory and research. The initial Sections describe the nature of problem-based learning in medical education, compare its educational goals with those of conventional, lecture-based instruction, and summarise the links that have been proposed between problem-based learning and theories of learning, such as information-processing approaches and enquiry learning. There follows an overview of those studies in which medical students in problem-based learning courses have been compared with medical students in conventional courses in specific aspects. These include personality traits, perceptions of the academic environment (e.g., enjoyment, stimulation, key course features) and approaches to studying (e.g., rote learning, learning for understanding). Reference is also made to some of the methodological considerations associated with carrying out research in this area. The final two Sections describe the theories of student learning and personality from which were derived the two questionnaires, on perceptions of learning and personality traits, that were employed in the study.

2.2 The nature of problem-based learning in medical education

Although problem-based learning has been associated most closely with health care education, it has been adopted as an educational approach in a range of subject areas and professions and, increasingly, on a world-wide basis (Lloyd-Jones, Margetson and Bligh, 1998). This does not mean, however, that 'problem-based learning' has been interpreted and implemented in identical ways in the different academic and geographical settings. Lloyd-Jones *et al* (1998) highlighted this particular point when they described PBL as 'a coat of many colours' in the title of their article. They went on to stress the implications of this feature for the generalising of research findings from different institutions which have utilised the PBL approach. Vernon and Blake (1993), authors of one of the two meta-analyses of evaluative research associated with PBL, concluded that:

'PBL ... is more than a simple teaching method. It is better described as a complex mixture of a general teaching philosophy, learning objectives and goals, and faculty attitudes and values, all of which are difficult to regulate ... The outcome variables that are often the most highly valued, and best exemplify the special features of PBL, are often complex, multidimensional, and difficult to measure.'

(1993: 560)

Problem-based learning in undergraduate medical education was initiated at McMaster University in Ontario, Canada in the late 1960's and by 1992 more than 80 medical schools world-wide had adopted PBL in at least one course in their undergraduate programmes (Block, 1996; Norman and Schmidt, 1992). The authors of the second meta-analysis of research into PBL, Albanese and Mitchell (1993), refer to the 'confusing and somewhat contentious task' (1993: 53) of defining what constitutes PBL in medical education. Drawing on key sources, in particular, the work of Barrows (1985; 1986), they described PBL in medical education in the following terms:

'Problem-based learning at its most fundamental level is an instructional method characterized by the use of patient problems as a context for students to learn problem-solving skills and acquire knowledge about the basic and clinical sciences.'

(1993: 53)

In addition, they contrasted PBL with associated methods:

'What distinguishes PBL from other problem-centered methods, such as the case method, is that in PBL the problem is presented first, before students have learned basic science or clinical concepts, not after. Most proponents would also agree that PBL problems

differ from the typical case history in that they do not (initially) provide or synthesize all the information needed to solve the problem; thus they provide greater realism and free enquiry.'

(1993: 53)

Moore (1991) provided the following clear summary of the general nature of PBL 'in practice' in medical education:

'In a curriculum based on PBL, students use clinical or research cases as the focus of discussion in small-group tutorials led by an academic staff member. After identifying terms that they do not understand, formulating hypotheses to explain the problem, and defining their learning objectives, group members work independently for a specified period of time using multiple resources for study. Returning later to the tutorial group, they elaborate upon what they have learned and may repeat the cycle. This method of learning may be the sole instructional method or may be blended with lectures, laboratories or other instructional methods.'

In PBL, therefore, there is a focus on the students taking greater responsibility for what and how they learn, more so than is likely to be the case in more traditional, lecture-based courses, thus the 'student-centred' and 'self-directed' descriptions of course and learner respectively. The student's role in PBL includes the defining of issues, identifying learning needs, drawing upon self-directed learning in relation to the problems or cases, and organising and integrating learning material. The PBL process is thought to be facilitated by small-group tutorials and independent study, with other, more traditional activities, such as lectures and labs, playing a much reduced role (Albanese and Mitchell, 1993; Block, 1996).

The introduction of PBL approaches in medical education has prompted considerable research interest in carrying out comparisons with more traditional or 'conventional' methods of instruction, specifically in terms of outcomes in students' cognitive and non-cognitive functioning (Kaufman and Mann, 1996a). However, as Albanese and Mitchell (1993) indicated, it cannot be assumed that the term, 'conventional', has been used to describe identical types of courses and methods: '... just as the definition of PBL is ambiguous, what constitutes a conventional educational program is also ambiguous.' (1993: 54) With this qualification in mind, it is still evident that 'conventional' or 'traditional' has been used in the research literature in medical education to describe courses which had certain features in common. These included a focus on the provision of discipline-based, self-standing courses in the basic sciences during the first one or two pre-clinical years; teaching methods which relied heavily on large-group lectures and structured laboratory classes; a heavy assessment load,

with a possible reliance on multiple-choice tests; and learning objectives and assignments which were supplied by the lecturers. The terms, 'conventional' and 'traditional' are employed in this thesis to convey the same description.

2.3 Educational goals of problem-based learning and lecture-based instruction

Until fairly recently, conventional approaches in medical education, especially in the first two (pre-clinical) years, relied heavily on lecture-based programmes in which the role of lecturer was that of a transmitter of expert knowledge to apparently passive learners. Generally, the main goal in this context has been the acquisition of a body of factual information (Block, 1996; Rosenthal and Ogden, 1998), and, for the purpose of achieving that end, the lecture has been regarded as an appropriate method. It is considered a less appropriate method for meeting broader educational aims. For instance, Entwistle, Thompson and Tait (1992: 33) concluded from the research literature that:

'There seems to be agreement that a *good* lecture is as effective as most other methods for transmitting information, but even a good lecture is less effective than good small group teaching for encouraging thought, changing attitudes, or promoting a more active approach to learning.'

Block (1996) summarised, very concisely, three main problems associated with 'traditional learning methods', problems originally identified by Dewey in the early 1930's and expanded upon more recently, with reference to medical education, by Neufeld and Barrows (1974) and Schmidt (1983), amongst others. The first problem turns on the argument that lectures appear to be an ineffective method of learning, given students' apparent inability either to recall or apply lecture material in the clinical setting. Secondly, although knowledge acquisition is clearly a desirable outcome of medical education, other outcomes are also important for students' development as doctors but these are unlikely to be generated by passive modes of learning. Such outcomes include the ability to think critically, the development of clinical judgement, self-directed learning skills necessary for continuing professional development, and communication skills essential for working effectively with patients and as a member of a professional team. The third problem associated with traditional educational methods, it has been argued, is that passive forms of learning are likely to reduce students' intrinsic motivation to learn.

In contrast, the emphases in problem-based learning are firmly on active rather than passive learning and on development of the skills required for problem-solving and lifelong learning. More specifically, Barrows (1986) set out four main educational goals of problem-based learning in medical education: *i)* the structuring of knowledge for application in the clinical setting *ii)* the development of clinical reasoning abilities *iii)* the development of self-directed learning skills and, dependent on the other three

goals, *iv*) the enhancement of intrinsic motivation for learning. Many of the research questions which have been investigated in the context of PBL in medicine have reflected these four educational goals (for meta-analyses of such research, see Albanese and Mitchell, 1993 and Vernon and Blake, 1993; for a qualitative literature review, see Berkson, 1993; for a shorter summary of research findings, see Block, 1996).

2.4 Theoretical underpinnings of problem-based learning in medicine

A number of theoretical foundations of the PBL model in medical education have been suggested by various writers. These theoretical frameworks have been summarised by Albanese and Mitchell (1993) while a more thorough treatment has been provided by Norman and Schmidt (1992). Those strands of learning theory which have been most frequently used to support problem-based learning as an instructional method have been, firstly, information-processing approaches, related to PBL by Schmidt (1983), and, secondly, Bruner's theory of discovery or enquiry learning, related to PBL by Barrows (1985).

Drawing on information-processing approaches to learning, Schmidt (1983) described the processes of activation of prior knowledge, elaboration of knowledge and encoding specificity as being especially relevant to problem-based learning. Since learners use their existing knowledge to make sense of new information, instructional methods

should capitalise on this. In PBL in medical education, clinical problems or cases should activate the knowledge that students already possess from their studies at school or college, for example, in the basic sciences. New information will also be understood and remembered more effectively if students have the opportunity to elaborate it, for instance, by means of activities such as discussion, teaching peers and posing questions as well as answering them, the kinds of activities which are identified closely with PBL. 'Encoding specificity' refers to the similarity between the situation in which knowledge is acquired and the situation in which that knowledge is to be applied, in that the greater the similarity between these two situations, then the more likely that transfer of learning will take place. The use of real-life clinical cases and problems, it is argued, should facilitate such transfer of learning.

Barrows (1985) has argued that learning by discovery or enquiry is a more effective method of learning, that is, when students are actively involved in the learning process and when learning is directed to a theme or a problem. Again, in contrast with traditional courses, which are thought to be teacher-centred and discipline-based, PBL programmes are characterised by being student-centred and thematic in content:

2.5 Relevant research findings from studies of students' perceptions of their learning experience

This Section summarises relevant studies of the perceptions of medical students of aspects of their learning experience. Included are studies of perceptions of the academic environment and the extent to which students' pre-course expectations were met; how students rated PBL and lecture-based courses on key course features; and perceptions of the academic or learning process and of their approaches to studying. The Section ends with a discussion of some of the major methodological problems in research in this area.

2.5.1 Students' perceptions of their learning environment

One of the main arguments used in defence of PBL is that, in comparison with a lecture-based course, it is more likely to provide students with a learning experience that they will find interesting and enjoyable. This clearly has implications for encouraging students to become lifelong learners and to continue their professional development. The data from the relatively small number of studies in this area have shown consistently that students who have studied in PBL modules or courses have reported high levels of satisfaction with and enjoyment of the small-group work and the learning atmosphere associated with PBL (Albanese and Mitchell, 1993; Vernon

and Blake, 1993). Block (1996), for example, referred to the results of an unpublished study which she carried out with colleagues and which utilised interviews with Harvard students who were following the PBL and conventional, lecture-based curricula (Moore, Block and Mitchell, 1990). In this study, the pre-clinical years were reported by students in the PBL curriculum as being more engaging, useful and difficult than was the case with the students in the conventional course. The latter were more likely to describe their experience as irrelevant, passive and boring.

A standardised questionnaire, the Medical School Learning Environment Survey or MSLES (Marshall, 1978), was used by Lancaster *et al* (1997) to assess students' expectations of their academic environment at the outset of their respective PBL and lecture-based courses. The students' expectations were then compared with their reports, at the end of first year, of how they had actually experienced that environment. The items in the MSLES measure seven features of the students' learning environment:

1. *Flexibility* – of the staff and of the curriculum in response to input from the students
2. *Emotional climate* - extent to which the curriculum promotes self-esteem and feelings of anxiety, depression and anger
3. *Student interaction* – the degree of cooperativeness

versus competitiveness

4. *Meaningful learning experience* – the relevance of content to medical practice, integration of basic and clinical science and an emphasis on concepts rather than facts
5. *Organisation* – the cohesiveness of the curriculum, the clarity of the learning objectives and the match between objectives and examinations
6. *Nurturance* – the quality of staff-student interactions and the level of interest in students and teaching on the part of staff
7. *Breadth of interest* – the student's breadth of interest within and outwith the curriculum

With reference to the above measures obtained at the orientation stage, Lancaster *et al* found that the students in the two courses matriculated with the same expectations of their course in all but one of the seven aspects. The exception was *flexibility*, with students entering the PBL course anticipating greater flexibility in their academic environment than did those entering the conventional course. However, by the end of their first year, in comparison with their expectations at matriculation, the PBL students reported significantly different ratings, based on their first year experience, on

six of the seven scales. They saw their academic environment as providing greater flexibility, a more positive emotional climate, and a more meaningful learning experience, encouraging more interaction amongst students, as being more nurturing and allowing exploration of special interests. In contrast, the students in the conventional course had experienced their academic environment as being worse than anticipated in these six areas.

The one area in which the experience of the PBL students fell short of their expectations was in terms of *organisation* – they perceived their learning environment as having been less organised than they had expected at the beginning of their studies. The researchers attributed this to the ‘inherent nature of PBL’ where the onus is on the students themselves rather than staff to structure their learning.

Similar ‘baseline’ expectations were reported for PBL and traditional students in a study by Lieberman *et al* (1997), again with the two groups of students differing only in respect of *flexibility*, which was higher for the PBL students at the beginning of first year. As in the previous study, the PBL students’ experience in first year exceeded their expectations in the same six areas but again showed the reverse for *organisation*, which turned out to be significantly lower than expected. Likewise, the students in the conventional course reported that their experience of the learning environment during the year was significantly less positive in all seven areas than they had anticipated.

The authors of both studies concluded that these changes in perceptions and the overall direction of them – i.e., in a positive direction for the PBL students and in a negative one for the traditional students – were of educational importance but added an important rider, warning that it could not be assumed that those differences that had been found in the students' first year of study would endure in the long term. In other words, the more positive reports of their academic environment given by the students in the PBL curriculum would not necessarily continue into the other years of their medical course.

2.5.2 Students' perceptions of key features of their medical courses

A small number of studies (e.g., Birgegård and Lindquist, 1998; Kaufman and Mann, 1996a; Mårtenson, Myklebust and Stalsberg, 1992) have examined the extent to which medical students, in PBL courses or modules and those studying in a more conventional format, have differed in their reported perceptions when they have been asked to rate their respective courses on a given set of features. Such features represent various curriculum outcomes, for instance, enjoyment, stimulation to learn more, and stimulation to read medical literature, and variables associated with the learning process, such as the understanding and application of principles and the solving of problems. In other words, these course outcomes and process variables embody behaviours and skills that many staff in higher education are likely to judge as being important in the development of students. It can be seen that these illustrations

of the kind of course features which have been investigated also reflect those areas which traditional approaches in medical education have been criticised heavily for not addressing and to which, it has been argued, problem-based learning is especially suited (e.g., Barrows, 1985; 1986).

A questionnaire devised by Mårtenson *et al* (1992) to investigate students' perceptions of course features in PBL and conventional courses was also used in subsequent research by Kaufman and Mann (1996a). Since one of the two checklists designed for the interviewees in the current study was based on that developed by Mårtenson *et al* (1992), the studies carried out by the latter and by Kaufman and Mann (1996a) are described in some detail.

In their questionnaire, Mårtenson *et al* (1992) asked students to rate the extent to which they thought that their courses were characterised by twelve features, each of which was rated by the students on a nine-point Likert scale, ranging from '1' (a small extent) to '9' (a large extent). Eleven of the twelve features in the questionnaire represented four major areas: *i*) higher-level thinking; *ii*) managing information; *iii*) stimulating self-directed learning; and *iv*) overall satisfaction. The twelfth item, '*learning of details*', was not classified by the researchers according to any of the four areas but stood on its own. The specific questionnaire items referring to course features used to measure students' perceptions are shown below. As can be seen, more than a half of the questionnaire items related to the first major area, higher-level thinking.

Higher-level thinking:

Understanding principles and being able to use them

Integrating different subjects in order to solve problems

Articulating previous knowledge

Stating learning objectives

Making decisions

Independent thinking

Problem-solving

Managing information:

Gathering and analysing information

Stimulating self-directed learning:

Stimulated to learn more

Stimulated to read medical literature

Overall satisfaction:

Stimulating and enjoyable

Learning details

Using this 12-item questionnaire, Mårtenson *et al* compared the perceptions of two cohorts of students in a nine-week course in the initial year of their medical courses.

The first cohort had studied the course in a traditional mode while the second cohort had taken the course in a PBL format. The study showed that the latter group reported their courses as being characterised by eleven of the twelve features to a significantly greater degree than was reported by the students in the more conventional format of the course. The 'learning of details' was the one feature for which the trend was reversed, with the students in the conventional course rating it as a stronger feature of their course than did the students in relation to their PBL course.

Similarly, Kaufman and Mann (1996a) used the questionnaire that Mårtenson and associates had developed to investigate students' perceptions of their courses but this time the focus was on the students' pre-clinical curriculum as a whole, not just one relatively short segment of it. The first cohort of students had studied in a conventional, lecture-based curriculum, while the subsequent cohort had followed a newly-established PBL curriculum in which radical changes had been made. Scheduled activities, such as lectures and laboratory classes, had been reduced by more than half; the course content had been organised according to multi-disciplinary units; case tutorials formed a major part of the weekly timetable; examinations were spread out over the year and reduced in number by more than half while tutorial evaluations by the tutor were included as part of the assessment process; and, lastly, a pass/fail grading system replaced the percentage grading of student performance. The questionnaire about perceptions of features associated with their courses was administered to each of the two cohorts of students at the end of the students' second year in medical school, just prior to entering their clinical training.

Kaufman and Mann reported results which resembled those of Mårtenson *et al* very closely, with students in the PBL curriculum believing strongly that their pre-clinical years had been characterised clearly by those features associated with higher-level thinking, the management of information, stimulating self-directed learning and overall satisfaction. Significantly lower ratings in these areas were given by students in the conventional curriculum, who, instead, thought that their course laid a heavy emphasis on the learning of details. The authors concluded that the differences they had observed between the students in the two different curricula were large enough to suggest a difference that was educationally significant, in terms of both the implementation of the two curricula and the students' experience of them.

Though carried out with students towards the end of first and second years of medical school respectively, the studies by Mårtenson *et al* and Kaufman and Mann were similar in that students were being asked about their pre-clinical courses or parts of these. A third study, by Birgegård and Lindquist (1998), which produced different results in some features, gathered data about students at both the beginning and end of their first clinical year. They also used a questionnaire, which, though not listing items identical to those used in the other two studies, incorporated very similar ones. Students were asked to use a ten-point scale ('1' = to a very small extent; '10' = to a very large extent) to gauge the extent to which the medical school had encouraged each of the following nine features:

1. *Critical thinking*
2. *Problem-solving*
3. *Study for examinations*
4. *Formulation and definition of problems*
5. *Study outside textbooks*
6. *Study of details*
7. *Decision-making*
8. *Study of literature for problem-solving*
9. *Ability to argue systematically pro/contra*

Both groups of students had studied for two-and-half years in a traditional, pre-clinical course but one group had then entered the 'normal' first clinical year where most of the students' time was spent in clinical wards, working in groups of three or four students per twenty patients. There was a small amount of small-group teaching, which included patient problems but not in a PBL form. A similar amount of time per week was spent in lectures and there were also routine case-based seminars. The subsequent group of students encountered the same pattern in their first clinical year but with PBL added on, in the form of cases worked on in problem-based learning groups with facilitators.

Both groups received the questionnaire about perceptions of their courses at the beginning and end of this first clinical year, since Birgegård and Lindquist were interested in the presence or absence of change in perceptions *within* each of the two

groups of students. The groups showed different patterns over the year in relation to the nine features. The students in the unaltered, conventional year showed significant change in their perceptions of four of the features: study for examinations, study of details, decision-making and problem-solving. By the end of their clinical year, these students thought that their medical course had encouraged the first three of these features to a lesser extent than they had reported at the beginning of the year. Conversely, the last of the four, problem-solving, they rated more highly at the end of the year than at the beginning. In contrast, the students who had experienced the PBL 'add-on' in the first clinical year reported significant changes in their perceptions of all but two of the features, these being '*study for examinations*' and '*study of details*'. In addition, the changes were all in the same direction. At the end of the year, compared with the beginning, these students rated their medical courses as reflecting to a greater extent the following: '*critical thinking*', '*problem-solving*', '*formulation and definition of problems*', '*study outside textbooks*', '*decision-making*', '*study of literature for problem-solving*', and '*ability to argue systematically pro/contra*'.

However, from the point of view of comparisons between this study and the other two by Mårtenson *et al* and Kaufman and Mann, what is of special interest is the rather different result obtained by Birgegård and Lindquist in respect of the feature, '*study of details*'. From the data presented, it appears that Birgegård and Lindquist carried out no formal statistical comparisons of the two groups but they observed that students in both courses had 'a discouragingly low opinion' of the extent to which their medical studies had encouraged skills such as critical thinking, problem-solving abilities,

decision-making and systematic argument. On the contrary, it seemed that their studies at medical school had encouraged, to a high degree, studying for examinations and the study of details in *both* courses.

This finding about the study or learning of details contrasts with those from the studies by both Mårtenson *et al* and Kaufman and Mann, in which this was the key feature which distinguished the perceptions of students in conventional and PBL courses. However, there are significant aspects in which the study by Birgegård and Lindquist differed from the other two and which might account for the variation in results. For instance, students in the former study were in their first clinical year, students in the other two studies were in one or other of their pre-clinical years. More importantly perhaps, all students in the study by Birgegård and Lindquist had come through a traditional course format in their first two pre-clinical years. Also, the PBL input for the second group of students in that study comprised an additional course component, 'bolted on' to the traditional clinical year in the absence of any major alterations to the existing course, to the extent that even the final examination, which was not tailored to PBL, had not been changed. In the other two studies, in comparison, students in the PBL courses reported perceptions about courses that had been fundamentally redesigned and which incorporated, as a major element, the *reduction* of scheduled activities.

2.5.3 Students' perceptions about approaches to studying and the academic process

The relatively few studies that have investigated the approaches to studying employed by students in PBL and traditional curricula have produced results that suggested that the PBL students made greater use of learning for meaning, or in-depth understanding, than learning to reproduce for examinations, or memorising and learning by rote. On the other hand, students in traditional courses showed the reverse pattern (Albanese and Mitchell, 1993; Block, 1996; Vernon and Blake, 1993).

Bernstein *et al* (1995), in a rather differently designed study, did not make use of a comparison group of students in a conventional course but instead students in a PBL section of the course constituted their own controls. By means of a pre- and post-course survey, this study examined the changes in students' attitudes before and after a short PBL section in their course. Bernstein *et al* found that the students' expectations that the PBL format would teach them how to learn and think rather than simply memorise were realised. The students reported that their retention of information was increased as a result of the opportunities for discussion in PBL and that PBL encouraged them to reflect on the material rather than memorise it: '... discussion forces you to think about the material as you are expected to contribute.' (1995: 246)

Vernon and Blake (1993) referred to two methodological considerations that applied to many of the studies which have investigated students' approaches to learning. Firstly, studies have often compared groups of students in a PBL and a conventional course where the groups have not been equivalent, that is, the students in a PBL course have often volunteered for that specific track. Secondly, the research instruments used to measure the outcomes have been self-report questionnaires to the exclusion of other behavioural measures. For these reasons, Vernon and Blake concluded that results obtained could have been the effect of either the particular curriculum (PBL or conventional) or of confounding (different types of students had been attracted to different types of curriculum).

Berkson (1993), having argued that there was evidence that conventional and PBL formats could both produce learning for comprehension and learning by rote, concluded that studying in a specific curriculum did not ensure that students would have specific approaches to learning. She also argued that students themselves were flexible in their approaches to learning and were likely to select the most appropriate strategy for the task in hand:

'Tasks that require comprehension for successful conclusion, whether they occur in PBL or traditional curricula, will encourage the use of comprehension-directed, or deep, cognitive learning approaches.'

(1993: S80)

One of the issues raised in discussions about research findings in relation to PBL (e.g., Albanese and Mitchell, 1993; Berkson, 1993; Block, 1996; Vernon and Blake, 1993) has been the question about the extent to which medical courses with a PBL format have provided an adequate coverage of subject content in comparison with that associated with courses which have a conventional format. In other words, while PBL might facilitate in-depth learning, it might not encourage breadth of learning. With reference to this, Albanese and Mitchell cited a study by Woodward and Ferrier (1982) of those who had graduated in medicine from McMaster University over a five-year period. More than a half of the graduates considered that a difficulty associated with their PBL curriculum had been that 'core' content had not been clearly identifiable. The study of students' pre- and post-course views by Bernstein *et al* (1995), which was mentioned previously, found that, prior to the PBL segment of their course, students were worried that learning in the PBL mode would result in gaps in their knowledge base, in 'the knowledge necessary' (1995: 246), and indeed these concerns remained after students had completed the PBL component. Students believed there was a danger that wrong information would fail to be corrected but instead would be reinforced by both 'naïve' students and staff. A typical response from students was that PBL would result in their having 'no base of knowledge to fall back on when a problem not covered is encountered.' (Bernstein *et al*, 1995: 246)

However, it seems that students in PBL courses have concerns not only about breadth of content and identifying the 'important' or central knowledge but also about depth of learning required of them when they have identified what they intend to study. Moffat, Ross and Morrison (1998) asked undergraduates, about halfway through the first term in their first year of the newly-established PBL curriculum at Glasgow University, about sources of stress they had encountered. These students comprised the second intake (1997-98) to the new course (Appendix 7 summarises the main features of the 'traditional' and PBL courses). The stressor which caused medium or maximum stress to the highest percentage of respondents (66%) was 'deciding how deeply I need to know a topic'. Indeed three of the 'top' five stressors were related to uncertainty on the part of the students about what was expected of them and about their progress. The other two stressors (of the three) were 'not knowing what is expected of me', reported by 54% of respondents, and 'being unsure of my own progress', which was endorsed by 53% of respondents. Uncertainty about how to prepare for their course examination, i.e., insecurity about how to cover the subject matter, was also reported by many of the students in the PBL 'add-on' in their first clinical year in the study by Birgegård and Lindquist (1998), described previously.

Similar results about the uncertainty felt by students in PBL courses were reported by Kaufman, Mensink and Day (1998) but they compared the stressors identified by students in both conventional and PBL courses. The most notable differences between the two groups of students arose from concerns about ambiguity and feedback. Here the PBL students selected three aspects significantly more frequently than students in

the conventional course: they were 'uncertain what is expected of me', they felt there was a 'lack of recognition for work done' and also that there was 'not enough feedback.' Although learning objectives were provided at the end of each week, many students still thought there was a lack of direction, not only in terms of the breadth of learning required, but also the depth.

2.5.4 Methodological issues in research into problem-based learning in medical education

Only those studies that appeared to have direct relevance to the topic in the current study were selected for inclusion in this Chapter and these represent a relatively small proportion of the research field in problem-based learning in medicine. For instance, the research studies included in the meta-analyses by Albanese and Mitchell (1993) and Vernon and Blake (1993) and the major review by Berkson (1993) encompassed various aspects of student performance and attitudes. On occasion, different reviewers and researchers have used different descriptors of these general aspects but the following categories, outlined by Block (1996), form a useful classification of the range of research activity which has not been referred to directly in the present Chapter: knowledge of basic science; clinical functioning and knowledge; psychosocial attitudes and competencies (e.g., communication skills, empathy, attention to the patient's perspective); choice of career in medicine; the attitudes of staff to PBL; and the costs of PBL.

The research base for problem-based learning in medicine has expanded fairly rapidly, especially since the early 1990's, but is still limited. Amongst its limitations are considerable methodological difficulties, rendering clear conclusions about the effectiveness of PBL premature. These difficulties arise from a number of sources, such as the considerable diversity in the ways in which different institutions have implemented problem-based learning, the possibility of selection bias in relation to the students included as participants in research studies, and variation and ambiguity in both the definition and measurement of the 'outcomes' of curricula (e.g., students' examination results, clinical ratings, attitudes). For example, with reference to course formats, comparisons may have been based on one or more PBL segments of, or modules within, a more conventional programme, or on a conventional programme and a parallel PBL programme within the same institution, or on the first pre-clinical years of a conventional programme and the first years of a newly established PBL course that has superseded the conventional one. Comparisons may have been based on courses at different institutions.

Students included in such research are usually not randomised to one or other curriculum but instead may have consisted of the following groups: those who were able to choose a traditional or a PBL course; those students who had no choice in following either curriculum; a PBL group of students consisting of those who had volunteered for PBL and were selected for it from a larger group who had applied for the conventional track; a single group of students who experienced both PBL and

conventional formats; or only those in a PBL course with no comparison group. Vernon and Blake (1993) referred to the problem of non-equivalent student groups in this kind of research. They considered that there was evidence to suggest that volunteers for a PBL curriculum may be different from 'regular' students and that the PBL pool of students may alter with time as PBL programmes become more widely established and 'mature'. Certainly researchers (e.g., Lancaster *et al*, 1997; Lieberman *et al*, 1997) who have found that PBL students reported highly positive reactions to the course after one year have warned against assuming that these kinds of reactions to the PBL format will hold over time.

Vernon and Blake (1993) commented on the difficulty of maintaining student participation in longitudinal studies, especially on the part of students in traditional courses. Schmidt (1990, in Albanese and Mitchell, 1993) also referred to the length of time over which evaluation of curricular innovation, such as PBL, has to be carried out and set this in the context of the numerous extraneous factors that might be uncontrolled and might affect results, for example, changes in admission procedures, or other changes in the curricula.

Finally, Vernon and Blake (1993) described another potential source of bias in research into PBL in medicine. Since the students in PBL courses were participating in something that was novel, this in itself might have been enjoyable and stimulating and might have created positive attitudes and have been reflected, for example, in their

reports of a high level of satisfaction with their learning experience. These effects, however, would not have been related to the theory or content of PBL itself.

2.6 Research into the personality traits of medical undergraduates

There is not a large research literature which is relevant to the relationship between personality and medical undergraduates. Such studies which do exist tend to focus on a small number of areas of interest. These have included tracing changes in the personality traits (e.g., extraversion, neuroticism, conservatism, self-assurance, etc.) of medical students at different stages of their undergraduate courses (e.g., Huxham, Lipton, and Hamilton, 1985; Zeldow, Daugherty and Leksas, 1987); investigating a possible relationship between personality traits and the choice of medical specialty, for example, surgery, psychiatry, general practice (e.g., Bland, Meurer and Maldonado, 1995); comparing the personality traits of medical students with those of the general population and undergraduates in other subject areas (e.g., Sade, Fleming and Ross, 1984); and investigating the relationship between personality and success in medical school (e.g., Green, Peters and Webster, 1993; Hojat *et al*, 1993).

It was possible to trace only one study which compared personality characteristics of medical students in PBL and lecture-based courses. The study, by Cariaga-Lo *et al* (1996), was prompted by two concerns. Firstly, in attempting to determine the relative effectiveness of PBL and lecture-based curricula, there is a need to establish, at the

stage of entry to the course, student characteristics which might affect their performance. Secondly, much of the research involving comparisons of the two course formats has investigated cognitive rather than non-cognitive variables.

Participants in the study consisted of three cohorts of students admitted to medical school in the period, 1991-93. After being admitted, students had the option of joining a two-year PBL curriculum or the standard lecture-based one. Volunteers were accepted for the former on a 'first come, first served' basis. A series of psychological assessments completed routinely during a pre-course orientation week included the California Psychological Inventory (CPI), which measures a number of personality traits. The researchers chose to focus on those traits in the CPI that were thought likely to be related to students' selection of curriculum and their subsequent performance. These traits were:

Achievement via conformance – the individual is strongly motivated to perform well but prefers tasks and expectations that are clearly defined

Achievement via independence – the individual is also strongly motivated to do well but prefers to work in situations which encourage autonomy

Introversion – the individual is introverted and reserved in manner

Norm-favouring – a tendency to follow rules, and to be conscientious and

self-disciplined

Self-realisation – a tendency to be reflective, capable and optimistic about current and future status

Comparisons of students on the above characteristics showed two significant differences at the time of entry to medical school. The students who had volunteered for the PBL course had higher scores on *self-realisation* and *achievement via independence* compared with those opting for the lecture-based one. It is possible that such personality traits might prepare these students for a course which consists of more small-group work, fewer structured activities and expects students to have more initiative. The authors concluded that those who are less self-sufficient and who need to have their roles defined may require a more structured curriculum, while those who are more independent are likely to do well in courses that are less structured and more individualised, such as problem-based settings.

Others (e.g., Brinton, Jarvis and Harris, 1984; Fox and West, 1984) have stressed the point that a single method, whether it be lectures or small-group work, is unlikely to meet the learning needs and styles of a range of students. Fox and West examined the association between personality factors and different strategies used by medical students in self-directed learning projects. The students were in first and second years and in a section of the course that used contract learning to provide them with experience in designing and implementing self-directed learning. Resources used for the latter included field-based learning experience, lectures and reading with the

students' work assessed by community experts, peers and academic staff, as appropriate. Each student's overall strategy for self-directed learning was then classified as 'traditional' (i.e., resembling those learning activities that would be common in a basic science classroom) or 'non-traditional' (i.e., more experiential and relying less on the academic institution). Students' scores on the Omnibus Personality Inventory and the Myers-Briggs Type Indicator were used to determine whether personality traits could distinguish between those who had undertaken 'traditional' and 'non-traditional' learning projects.

Fox and West identified a cluster of traits that seemed to be associated with choice of self-directed learning. In comparison with those who had used a 'traditional' strategy, students who were likely to have adopted a 'non-traditional' stance had the following traits: they were more comfortable with ambiguity, were more extraverted, were more 'diverse' and artistic in orientation (i.e., aesthetic), were less anxious and they sought autonomy. Fox and West described these personality factors as indicating 'an extrinsic, environmental orientation' (1984: 24). Strategies used by such students for self-directed learning were more experiential and less dependent on the familiar patterns linked with the academic institution. On the other hand, those who were more likely to have employed 'traditional' strategies tended to be more anxious in unfamiliar situations, more introverted and more self-focused. Finally, from students' evaluations of the usefulness of their self-directed learning experiences, there was some evidence to suggest that, when a student used a strategy for learning that was inconsistent with his/her personality traits, reactions to that learning activity were

often negative. The authors considered the results valuable in providing evidence to support the view that some features of personality are related to students' strategies 'when choices are available' (1984: 24). However, they also referred to a much more fundamental issue and one which could have implications for admission policies:

'Implicitly, the study also prompts discussion as to whether good lifelong learners should be identified in the admissions process ... or should be trained to be effective lifelong learners. One may argue that to assume that lifelong learners should be identified in the admissions process is to assume that effective habits of lifelong learning are a direct function of traits which are relatively stable and unchanging over time. If success in self-directed learning is assumed to be a function of skill, then the issue is how to develop that skill, not how to identify it in entering students.'

(1984: 25)

There has been some interest in investigating '*tolerance of ambiguity*' amongst medical students (e.g., Sobal and DeForge, 1991) and this would seem to be a characteristic of some relevance to PBL course formats and to medical practice. Budner (1962: 29-30) defined 'tolerance of ambiguity' as 'the tendency to perceive ambiguous situations as desirable' and 'intolerance of ambiguity' as 'the tendency to perceive (i.e. interpret) ambiguous situations as sources of threat'. The adjective, 'ambiguous', refers to situations 'which cannot be adequately structured or categorized

by the individual because of the lack of sufficient cues ...in short, situations characterized by novelty, complexity, or insolubility.'

Frenkel-Brunswick (1949) was the first to provide a comprehensive treatment of tolerance of ambiguity, which was described as being open to new ideas, willing to examine concepts from different perspectives and the ability to cope with difficult situations. In contrast, someone who was intolerant of ambiguity tended to resort to black-versus-white solutions and was unwilling to consider the greyer reality. In addition, a person was intolerant of ambiguity if he/she were unwilling to consider probabilities but preferred to escape into whatever seemed certain or concrete.

No study could be found which had investigated tolerance of ambiguity amongst students in PBL and traditional curricula. Those studies that have been carried out (e.g., Bland, Meurer and Maldonado, 1995) have tended to focus on investigating possible relationships between tolerance of ambiguity and students' choice of medical specialty. Such studies have produced conflicting results about its effect in medicine and it is possible that this is the result of problems of reliability and validity of the measures used for tolerance of ambiguity (Merrill *et al*, 1994). However, it does seem to be a characteristic that is relevant to problem-based learning in medicine for a number of reasons. Firstly, it would appear to have a strong link with the aims of PBL in medicine – the encouraging in students of critical, independent thinking in which account is taken of contexts and 'probabilities' and the application of theory to imperfect 'real-life' settings. Secondly, the sources of stress identified by medical

undergraduates (Section 2.5.3) reflect clearly concerns about 'uncertainty' in PBL, about what is required of students in terms of their progress in the course and the breadth and depth of content to be learned. Lastly, Perry (1970, 1981, 1988), whose scheme of cognitive development formed the basis of one of the two questionnaires used in the present study, identified ability to cope with uncertainty and ambiguity as being associated with the 'higher' levels of cognitive development in undergraduate students.

The remaining two Sections of this Chapter provide an overview of the theoretical foundations of the two questionnaires which were used in this study. The first questionnaire was devised as a measure of medical undergraduates' perceptions of their learning experience in the two different curricula, one of which was a traditional, lecture-based programme, the other a programme in a problem-based learning format. This questionnaire was influenced by the work of Perry (1970, 1981, 1988). The second questionnaire was a personality inventory, devised by Costa and McCrae (1991), whose theory of personality is one of the 'Big-Five Factor' theories which have become prominent since the early 1990's. The content and format of the two questionnaires are described in detail in Chapter 3. What is presented below is a setting of the theoretical scene for each of these measurement tools.

2.7 Theoretical bases of the two questionnaires used in the research: i) Perry's Scheme of Cognitive and Ethical Development

The first questionnaire, the learning perceptions questionnaire, was designed specifically for this study but drew heavily on previous questionnaires developed by researchers in the Centre for Science Education, University of Glasgow, which, in turn, had been devised as measures of Perry's Scheme of Intellectual Development (1970, 1981, 1988).

Perry's (1970) longitudinal study investigated the nature of development in patterns of thinking in undergraduate students and the ways in which they made sense of their educational experience. The outcome of his research was a scheme, or map, of intellectual and ethical development, in which he described a series of nine 'Positions' or stages, together with their associated transitions, in the individual's developmental journey. Perry regarded the transitions between each stage as being as important as the stages themselves:

'...Positions are by definition static, and development is by definition movement ... Each of the Positions was obvious and familiar in its delineation of a meaningful way of construing the world of knowledge, value, and education. The drama lived in the variety and ingenuity of the ways students found to move from a familiar pattern of meanings that had failed them to a new vision that

promised to make sense of their broadening experience, while it also threatened them with unanticipated implications for their selfhood and their lives ... (Perhaps development is all transition and “stages” only resting points along the way.)’

(1981: 78)

Each Position reflects the person’s way of thinking about knowledge, self and the world, as well as how learning takes place. Perry conceptualised the Positions as representing a hierarchical sequence in which individuals moved from relatively simple ways of thinking to highly complex ways of perceiving and evaluating knowledge and their world. Perry emphasised this point about the hierarchical nature of the scheme:

‘Notice that each Position both includes and transcends the earlier ones, as the earlier ones cannot do with the later. This fact defines the movement as *development* rather than mere changes or “phases”.’

(1981: 78)

Movement through the nine positions is from a basic ‘dualism’, that is, thinking in terms of black *versus* white or right *versus* wrong; through ‘multiplicity’, where the person recognises that diversity of opinion exists in some areas but this is interpreted

as resulting from confusion in the 'authorities' and inadequate understanding; to 'contextual relativism', where shades of grey are recognised and the context of knowledge and values is seen as being as important as the knowledge and values themselves (Merriam and Caffarella, 1991; Moore, 1988). As Moore (1988: 11) noted, this kind of evolution in an individual's ways of thinking 'closely mirrors the image of an educated person embedded in the vision of Western higher education.' Further, he suggested that this 'compatibility suggests the usefulness of the Perry scheme as a measure of college outcomes.' (1988: 11)

The nine Positions and related transitions are described below, as in Perry (1981: 79).

Position 1: Authorities know, and if we work hard, read every word, and learn Right Answers, all will be well.

Transition: But what about those Others I hear about? And different opinions? And Uncertainties? Some of our own Authorities disagree with each other or don't seem to know, and some give us problems instead of Answers.

Position 2: True Authorities must be Right, the others are frauds. We remain Right. Others must be different and Wrong. Good Authorities give us problems so we can learn to find the Right Answer by our own independent thought.

- Dualism** Transition: But even Good Authorities admit they don't know all the answers *yet!*
- Modified** Position 3: Then some uncertainties and different opinions are real and legitimate *temporarily*, even for Authorities. They're working on them to get to the Truth.
- Transition: But there are *so many* things they don't know the Answers to! And they won't for a long time.
- Position 4a:* Where Authorities don't know the Right Answers, everyone has a right to his own opinion; no one is wrong!
- Transition: But some of my friends ask me to support my opinions with facts and reasons.
- (and/or)*
- Transition: Then what right have They to grade us? About what?
- Relativism** *Position 4b:* In certain courses Authorities are not asking for the Right Answer; They want us to *think* about things in a certain way, *supporting* opinion with data. That's what they grade us on.
- Discovered** Transition: But this "way" seems to *work* in most courses, and even outside them.
- Position 5: Then *all* thinking must be like this, even for Them. Everything is relative but not equally valid. You have to understand how each context works. Theories are

not Truth but metaphors to interpret data with. You have to think about your thinking.

Transition: But if everything is relative, am I relative too? How can I know I'm making the Right Choice?

Commitments Position 6: I see I'm going to have to make my own decisions in an uncertain world with no one to tell me I'm Right.

In Relativism Transition: I'm lost if I don't. When I decide on my career (or marriage or values) everything will straighten out.

Developed Position 7: Well, I've made my first Commitment!

Transition: Why didn't that settle everything?

Position 8: I've made several commitments. I've got to balance them – how many, how deep? How certain, how tentative?

Transition: Things are getting contradictory. I can't make logical sense out of life's dilemmas.

Position 9: This is how life will be. I must be wholehearted while tentative, fight for my values yet respect others, believe my deepest values right yet be ready to learn. I see that I shall be retracing this whole journey over and over – but, I hope, more wisely.

As can be seen, the first five positions focus on cognitive stages, while the last four are concerned with ethical development resulting from making personal commitments.

Within the scheme, the individual's 'ways of seeing the world' are reorganised as the person confronts social and intellectual challenges, either by chance, through social situations, or by design, through an educational programme (Salner, 1986). Loevinger (1987: 238) vividly described Perry's scheme for development as an 'ameboid model':

'The individual moves forward with respect to some topic of special interest or personal relevance. Only gradually does the style of thinking about other topics catch up with the most advanced contingent.'

The analogy of a 'map' or 'scheme' of development might suggest that Perry viewed growth as linear but he clearly saw it as 'recursive', with each person following his/her own individual path of progression:

'We turn and turn again, and when we come across our own footsteps we hope it will be with the perspective of some altitude and humour ... in the several areas of their lives, such as their work, politics, social relationships, family, or religion, people (including

ourselves) often employ somewhat different levels of thought. As teachers, we often use these variations by finding the areas of students' most sophisticated thought and helping them to move by analogy into areas in which they are less advanced. Indeed students will often do so simultaneously.'

(1988: 158)

Perry also described three alternatives to progression in the scheme – temporising, retreat and escape – whereby the learner may regress to a lower level or remain at a given level (Perry, 1981). 'Temporising' refers to pausing for some time, possibly more than a year, in one position, usually accompanied by an awareness of the step ahead. 'Retreat', according to Perry, usually represents a regression to extreme Dualism and may occur after the person has had a glimpse of multiplicity. It involves the person actively denying that other people's opinions are legitimate. Examples may be found in the 'dedicated reactionary, a dogmatic rebel, or in passive resistance to authority without espousing a cause'. (Loevinger, 1987) 'Escape' is a more complex reaction, with the person steadfastly in a middle position, exploiting multiplicity or relativism to avoid Commitment, and may become alienated or cynical as a result.

Perry's Positions have also been used to describe how students view their roles as learners and those of their teachers or lecturers, and to suggest how students might be appropriately challenged to move forwards within the scheme (e.g., Finster, 1991;

Fitch and Culver, 1984; Simpson, Dalgaard and O'Brien, 1986). Johnstone (1998) has evolved a simplified version of Perry's scheme, in which the original nine Positions have been drawn into three groupings, as shown in Table 1. These groupings reflect 'A'-type, 'B'-type and 'C'-type perceptions on the part of students in relation to four major factors of the learning environment: the student's role; the role of lecturers/members of staff; the nature of knowledge; and the student's task in examination/assessment situations.

Table 1 Simplification of Perry's scheme of cognitive and ethical development

<i>Perceptions of:</i>	Student in Position 'A'	Student in Position 'B'	Student in Position 'C'
<i>Student's role</i>	Passively accepts.	Realises that some responsibility rests with the student. But what? And how?	Sees student as source of knowledge or is confident of finding it. Debater, making own decisions.
<i>Role of lecturer / Member of staff</i>	Authority, giving facts and know-how.	Authority. Where there are controversies, wants guidance as to which view is favoured by staff.	Authority among authorities. Values views of peers. Member of staff as facilitator.
<i>Nature of knowledge</i>	Factual; black and white; clear objectives; non-controversial; exceptions unwelcome.	Admits 'black-and-white' approach not always appropriate. Feels insecure in the uncertainties this creates.	Wants to explore contexts; seeks interconnections; enjoys creativity; scholarly work.
<i>Student's task in examinations/assessments</i>	Regurgitation of 'facts'. Exams are objective. Hard work will be rewarded.	Quantity is more important than quality. Wants to demonstrate maximum knowledge.	Quality is more important than quantity. Wants room to express own ideas and views.

(Johnstone, 1998)

At one extreme, there is the student for whom knowledge consists of right answers, who expects to be spoonfed the 'right answers' by the lecturer, and who sees the students' responsibilities as learning and memorising the facts and regurgitating these in assignments and examinations. At the other extreme is the student who is a critical, independent learner, who regards the students' task as demonstrating that they can evaluate possible solutions to a problem on the basis of evidence. 'Knowledge' is seen as uncertain - shades of grey, not black and white, are perceived - and the individual copes with this uncertainty by taking into account the contexts in which decisions are made. The lecturer's responsibility is seen as one of providing knowledge within a context and of demonstrating evidence for a decision or opinion. Varying levels of confidence on the part of the student are associated with the different types of perceptions. Student A has confidence in the system, as represented by the lecturer and familiar methods of teaching (e.g., lecture) and assessment (e.g., exams). Student C is also confident but this is a confidence in self and in his/her ability to learn. In contrast with both Student A and C, Student B is faced with feelings of uncertainty, confusion and low self-esteem.

Perry's scheme of development is possibly less well-known in the United Kingdom, appearing more frequently in textbooks and articles in the field of adult education (e.g., Merriam and Caffarella, 1991), and even then often mentioned briefly. However, Perry's work was one of the first to investigate cognitive development beyond adolescence and from it there have evolved other theoretical approaches, such as those of King and Kitchener (1994, in Hettich, 1998) and Baxter Magolda (1996,

in Hettich, 1998). It has generated a considerable amount of research, especially in the United States, in diverse areas of post-school education, including medicine, law, engineering, science and teacher training. There exists a cumulative bibliography of research studies which have been based on his scheme of development, the most recent edition of which listed more than five hundred references (Moore, 1990).

There have been criticisms of Perry's research methodology and of the scheme itself. For instance, the participants in his initial longitudinal study were Harvard undergraduates, not a group that could be regarded as representative of undergraduates in general. In addition, a quarter of the participants were women but the major analyses were based on interview data from the men (Loevinger, 1987). In terms of the scheme itself, a criticism has been that 'change', in relation to the nine positions, required to be defined and measured more clearly (Hettich, 1998). It has also been claimed that the scheme does not describe a hierarchy in which one stage is superior to or 'better' than another (e.g., Salner, 1986). However, on reading the description of each Position, it is difficult to ignore the temptation of regarding the Positions associated with 'contextual relativism' as more desirable stages or processes for students in higher education than those describing 'dualism'. Certainly, much of the research in educational settings (e.g., Finster, 1991) seems to have had the aim of determining how best to challenge students in order to encourage them to move to 'higher' Positions, that is, from Positions 1 to 9, or as close to 9 as possible.

One area which has been problematic is that of measurement of an individual's Position within the scheme. In the original research, Perry used unstructured interviews, as did early follow-up studies (Moore, 1988). Although these produce extremely rich data, they are time-consuming in a number of ways and inappropriate for use with large groups of students. Moore (1988) summarised the range of instruments which have been developed in attempts to place individuals in the scheme. These included structured interviews, paraphrasing and restatement tasks, sentence stems and semi-structured essay tasks (the Measure of Intellectual Development: Knefelkamp, 1974; Widick, 1975), and a variation of the essay stem approach (the Measure of Epistemological Reflection: Porterfield, 1984; Taylor, 1983). Because of the nature of the format of these instruments, none was considered appropriate for the large numbers of students (more than 200 per course) that would be invited to take part in this research study. For this reason, it was decided to adapt a questionnaire that had been designed in a recent study (Harvey, 1994) as a gauge of students' Positions in Perry's scheme and in which the original nine Positions were grouped to reflect three stances, 'A', 'B' and 'C' (Table 1). The questionnaire is described in detail in Chapter 3.

Despite the criticisms of Perry's framework which have been raised, there seems to be agreement in the literature that both Perry's work and that carried out subsequently by King and Kitchener (1994) and Baxter Magolda (1996), amongst others, have made an important contribution to the field of learning. Its significance has been summed up by Hettich (1998) in the following way:

'The works of Perry and [others] essentially and collectively represent a single *model* of epistemological knowing that has evolved over the past four decades but with different points of emphasis. That the different populations sampled yielded generally similar structures is testimony to the robustness of the model, the methodologies used and the basic theoretical assumptions proposed. Differences exist among theorists in their emphasis, characteristics of stages, scope of knowing, and other issues; but the similarities are more numerous than the differences.'

(1998: 55)

Finally, the features associated with the stance of 'Perry' Student C in Table 1 would seem to coincide with the desired outcomes of undergraduate medical courses referred to in recent recommendations by the General Medical Council (1993). The position of Student C is thought to be characterised by attitudes that are likely to reflect a critical, self-directed student, a learner who is capable of evaluating information and evidence and who wants scope to demonstrate his/her understanding of the complexities of a field of study. The GMC's document, *Tomorrow's Doctors*, is expecting similar skills and attributes in medical graduates, with emphasis on their being able to apply theoretical knowledge in a range of clinical contexts, to have good communication skills, and to be self-directed, lifelong learners for purposes of

continuing professional development in an increasingly complex and demanding profession.

2.8 Theoretical bases of the two questionnaires used in the research: ii)

Costa and McCrae's Five-Factor Theory of Personality

Different theories of personality have different emphases, frequently having been developed to serve somewhat different purposes. For example, clinical theorists (e.g., Rogers, 1959) have attempted to discover the processes and beliefs that affect how people cope with life's demands while trait theorists (e.g., Cattell, 1966; Eysenck, 1967; McCrae and Costa, 1985) have tried to distil the essential dimensions of personality that are shared by all individuals.

The basic tenets of trait theory are being employed when individuals are described as, for instance, 'independent', 'friendly', 'aggressive', 'shy'. As Hampson (1988) pointed out, definitions of traits abound but the following, from Reber (1985), is comprehensive and incorporates three basic assumptions of a trait, that is, a trait is relatively enduring, distinguishable, and describes how one individual differs from others:

'[a trait is] ... any enduring characteristic of a person that can serve an explanatory role in accounting for the observed regularities and

consistencies in behaviour ... a trait is a ... hypothesized, underlying component of the individual that is used to explain that person's behavioural consistencies and the differences between the behavioural consistencies of different persons.'

(Reber, 1985: 782)

Prominent trait theories of personality have been those put forward by Cattell (1966) and Eysenck (1967). Cattell, after considerable research carried out over many years, identified 16 central traits, including, for instance, 'sociable-unsociable', 'intelligent-unintelligent', emotionally stable-unstable, 'dominant-submissive'. In contrast, Eysenck proposed that two personality factors – 'introversion-extraversion' and 'neuroticism-emotional stability'- were sufficient to account for most of the personality differences amongst individuals but later he added a third, 'psychoticism' (Eysenck and Eysenck, 1976), although this one has not been as well-established or researched as the other two. Personality questionnaires developed by Cattell (16PF) and Eysenck (*EPI*; *EPQ*), based on their respective theories of personality, have been used frequently in studies of personality of medical students. For example, Zeldow, Daugherty and Leksas (1987) employed short measures based on the *EPI* while Huxham, Lipton and Hamilton (1985) used both the 16PF and the *EPI*.

Many trait researchers have found Cattell's sixteen-factor theory overly complex, with redundant factors, and Eysenck's three-factor theory oversimplified. Since the

early 1990's, based on a considerable body of research using a variety of personality assessment instruments, a consensus seems to be emerging that five central traits – the 'Big Five' – may provide the most efficient description of personality (Digman, 1990). Although there remains disagreement about how best to name and interpret the factors, there are many more areas of agreement. The names and descriptions of the five factors provided by Costa and McCrae (1991) seem to be representative (Cavanaugh, 1993; Eysenck, 1998). More detailed descriptions of the five factors are provided in Chapters 3 and 7 but the following summarises them all:

<i>Neuroticism:</i>	Worrying, insecure, vulnerable
<i>Extraversion:</i>	Sociable, talkative, impulsive
<i>Openness:</i>	Imaginative, liberal, flexible in thinking, curious
<i>Agreeableness:</i>	Co-operative, friendly, altruistic
<i>Conscientiousness:</i>	Conscientious, responsible, careful

Although historically there has been some debate about the best way to describe accurately the last three factors in the list, there is little disagreement in the literature about the definition of Extraversion and Neuroticism (Deary and Matthews, 1993). However, given the characteristics thought to be associated with a Student C type of stance which were described in Table 1, the factor that seemed of most relevance to this study was Openness. This dimension has also been interpreted as 'intellect' (Digman, 1990). In their personality theory, Costa and McCrae (1991) use the label to refer to flexibility of thought, and openness to feelings and new ideas. They

concur with Deary and Matthews' (1993) account of the Five-Factor Model but are 'confused' by Deary and Matthews' suggestion that 'openness' may lie in the ability domain. Costa and McCrae (1993) argue that the evidence suggests that 'openness' is not equivalent to 'ability'. They state that:

'Openness ... is modestly ($r = .3$) related to intelligence and moderately ($r = .4$) related to divergent thinking abilities, but ... in joint analyses it clearly forms a separate factor.'

(1993: 302)

Digman (1990), in his review, concluded that it is likely that this personality factor represents a number of these features, in other words, it indicates a domain of trait characteristics that are related in varying degrees.

'Neuroticism', 'extraversion', and 'openness to experience' were the three factors originally proposed by Costa and McCrae in their model of personality and have been the ones most heavily researched. In the late 1980's, the other two factors, 'agreeableness' and 'conscientiousness' were added to bring the theory in line with other developments in trait theory and to incorporate more research data (Cavanaugh, 1993). They also developed a personality inventory, the *NEO* Personality Inventory, to measure the five factors, a shorter version of which (the *NEO* Five Factor

Inventory) was used in this study. Its format and content are discussed more fully in Chapter 3.

There seems to be considerable agreement that the 'Big Five' model has made a distinctive contribution to identifying central dimensions in personality. According to Eysenck (1998):

'There is impressive evidence supporting the view that there are five major personality factors, and they are at least approximately as described within the five-factor model ...It is a real achievement that different lines of research have converged on the same (or almost the same) five personality traits.'

(1988: 452)

Digman's assessment (1990) is similar:

'At a minimum, research on the five-factor model has given us a useful set of very broad dimensions that characterize individual differences. These dimensions can be measured with high reliability and impressive validity. Taken together, they provide a good answer to the question of personality *structure*.'

(1990: 436)

However, as he adds, ‘the *why* of personality is something else.’ (1998: 436) Trait theories may be able to describe the elements of personality but they do not explain personality. The processes underlying individual differences in personality – why person A is more extraverted or more emotionally stable or more open to experience than person B – are still unclear.

Despite this, for the purposes of this study, it was thought to be potentially useful, as well as interesting, to investigate a possible association between students’ scores on an inventory designed to assess the five factors and their perceptions of their learning experience based, in turn, on a questionnaire informed by Perry’s scheme of cognitive and ethical development. In particular, there seemed to be a logical similarity amongst the characteristics associated with Costa and McCrae’s personality factor, ‘openness to experience’, the attitudes and perceptions that were thought to be associated with a ‘C’ type of stance, based on Perry’s work, and the attributes expected of the medical graduates who will be *‘Tomorrow’s Doctors’*.

2.9 Summary of Chapter

Problem-based learning has been implemented in diverse forms. It has been proposed that, in comparison with traditional, lecture-based courses, it encourages students to adopt information-processing approaches that are thought to lead to more effective

learning and enables students to achieve wider educational goals than simply the acquisition of knowledge.

There exists a relatively limited amount of research into medical students' perceptions of PBL and conventional courses. What there is has generally suggested that students in PBL pre-clinical courses are more satisfied with their learning experience and enjoy it to a greater extent than those in conventional courses, their actual experience often exceeding their pre-course expectations. They have also tended to view their courses as encouraging the use of higher level thinking skills and those required for managing information. In contrast, the experience of those in conventional courses has been more negative than they had anticipated, their courses being seen as having an emphasis on the learning of details rather than on higher level thinking. PBL students have reported less organisation in their courses, compared with students in conventional courses, and have felt anxious about the depth and breadth of their knowledge base and uncertainty about what was expected of them and about their progress.

Studies of personality with medical students have generally relied on inventories of personality traits as their measuring instruments. The few studies of personality that are of relevance to the current study have found that more experiential forms of self-directed learning were related to the personality traits of autonomy, extraversion, aestheticism, and being comfortable with ambiguity and a link between choice of PBL course and traits of independence and reflection. Tolerance of ambiguity is one

factor which has been investigated in a few studies of medical students and practitioners, although not with reference to PBL courses.

There are a number of methodological issues that arise in research in this area, the most prominent concerning the characteristics of the student groups involved and the definition and measurement of course outcomes. Overall, the methodological basis of research in problem-based learning in medical education seems almost chaotic, although that, in itself, may reflect the problems of conducting research in 'real life' settings in which it is often impossible to implement an 'ideal' research design.

Finally, the two theories which are directly related to the two questionnaires used in the present study were described. These were Perry's scheme of cognitive and ethical development and the Five-Factor theory of personality, with specific reference to Costa and McCrae. There appeared to be a similarity between the description of the skills and abilities expected of new medical graduates (as set out in recent recommendations by the GMC), Costa and McCrae's description of the personality factor, 'openness to experience', and Perry's description of the 'world view' of students in the later stages of his scheme of development.

CHAPTER 3

METHODOLOGY USED IN THE RESEARCH STUDY

3.1 General design of the study

The study included two cohorts of medical undergraduates at the University of Glasgow:

- i) those students enrolled in 1995 in the first undergraduate year of the existing medical curriculum and
- ii) those students enrolled in 1996 in the first year of the newly-established problem-based curriculum which had replaced the former course

Three measuring instruments were employed to gather information from the students:

- i) a questionnaire devised to investigate students' perceptions of learning and the learning environment, specifically perceptions of their role as 'student', of the role of 'lecturer' or 'member of staff', of their task in

assessments and examinations, and of the nature of knowledge. The aim of the questionnaire was to give an indication of students' positions (A, B, C) in terms of the adapted version of Perry's scheme of cognitive development (see Table 1, Chapter 2). The development and design of the questionnaire are discussed in Section 3.3.1. In order to trace possible changes during the first year, this questionnaire was distributed twice (Terms 1 and 3 in first year) to all students in both courses.

- ii) individual interviews with students towards the end of the second year (end of Term 2/beginning of Term 3) to explore in more depth perceptions of their learning experience as medical undergraduates and their approaches to studying, especially in relation to preparation for examinations and possible differences between learning in a school environment and learning at university.

- iii) A standardised personality inventory, the *NEO Five Factor Inventory*, *NEO-FFI*, (Costa and McCrae, 1991), which measures five dimensions: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness. It was thought that *NEO-FFI* measures associated with intellectual curiosity (openness to experience), independence of judgement (openness to experience), and academic and occupational achievement (conscientiousness) might be

of particular interest, especially possible relationships between these variables and students' perceptions of learning. Each of the five factors is described more fully in Section 3.3.1. The inventory was distributed to students in both courses towards the end of their second undergraduate year (end of Term 2/beginning of Term 3).

Table 2 summarises the scheduling of questionnaire distribution and interviews for students in both the traditional and PBL course.

Table 2 Timing of questionnaires and interviews in the first two undergraduate years: traditional course and PBL course

<i>Point in time:</i>	Questionnaire about perceptions of learning	Personality Inventory (NEO-FFI)	Individual Interview
<u>Traditional course:</u>			
<i>Beginning of first undergraduate year (middle of Term 1)</i>	✓		
<i>End of first undergraduate year (middle of Term 3)</i>	✓		
<i>Middle/end of second undergraduate year (end of Term 2/ beginning of Term 3)</i>		✓	✓
<u>PBL course:</u>			
<i>Beginning of first undergraduate year (middle of Term 1)</i>	✓		
<i>End of first undergraduate year (middle of Term 3)</i>	✓		
<i>Middle/end of second undergraduate year (end of Term 2/ beginning Term 3)</i>		✓	✓

3.2 Procedure

The questionnaire about learning experience was distributed to both undergraduate cohorts at two points in time during the first year of their medical degree course in order to trace possible changes in the students' perceptions of that experience. Each cohort was asked to complete the questionnaire near the beginning of first year (Term 1, Week 5) and again near the end of first year but before degree examinations had taken place (Term 3, Week 5).

In the case of students in the traditional course, the researcher distributed the questionnaire at the beginning of laboratory classes and students completed them at a convenient point during these. It was not possible to use the same method of distribution to students in the problem-based course, since they met infrequently in large groups. These students, therefore, received questionnaires from their group facilitators, who, in a covering letter, were given information about the purpose of the research study and asked for their assistance in giving out the questionnaires. The group facilitators were asked also to receive completed questionnaires from students in their groups.

Towards the end (Term 2/Term 3) of the second undergraduate year, the students in each of the two cohorts were asked to complete a personality inventory, the *NEO Five-Factor Inventory* (Costa and McCrae, 1991). At this stage in their second year (Term 3), the students in the traditional course were rarely in large teaching groups

and so the personality questionnaires were distributed when the students met in small groups for role play sessions which formed part of a course on Communication Skills. Students in the problem-based curriculum met at the end of Term 2 in second year for a briefing session about forthcoming examinations and this provided an opportunity for the distribution of the personality inventories to the entire group.

In addition, at this stage (Term 2/Term 3 in second year), a small sample of students from each cohort was invited to take part in individual interviews to explore in more depth students' perceptions of their learning experience. Students were selected for interview on the basis of responses to one section of the questionnaire about perceptions of learning: that is, those students who had shown considerable change in their response - between the beginning and end of their first undergraduate year - to a question about what they thought was expected of them in assessments and examinations.

3.3 Measuring Instruments

The three measuring instruments used in the study are described in detail in Sections 3.3.1 – 3.3.3.

3.3.1. Questionnaire about students' perceptions of learning

The questionnaire (see Appendix 1) consisted largely of an adapted version of one developed in a previous study by Harvey (1994) for use with undergraduate Biology students. She drew on Finster's (1989) application of Perry's scheme to chemistry undergraduates (see also Table 1, Chapter 2) and compiled a series of statements with which only a student at a certain stage (i.e., 'A', 'B' or 'C') might be expected to agree. For instance, a student at the 'A' ('Dualist') stage might be expected to agree with statements about nature of knowledge and the roles of lecturer and student which reflect the kind of views described in the second column of Table 1 in Chapter 2. Conversely, a student at the 'C' ('Relativist') stage might be expected to disagree with these statements. The various stages through which Harvey (1994) developed and refined her instrument for measuring students in relation to Perry's scheme are summarised below.

Stage 1:

- A list of 33 statements was constructed which might distinguish amongst students at 'A', 'B' and 'C' positions.

Stage 2:

- The above list of statements was subjected to the scrutiny of a panel of experts who were familiar with Perry's scheme.

- Task of the experts: to determine the extent to which the statements were likely to discriminate amongst students at 'A', 'B' and 'C' stages ('Dualism', 'Multiplicity' and 'Relativism'). The panel agreed that they did in fact discriminate in this way.

Stage 3:

- Each of the 33 statements was written on a separate card. Twelve students, both undergraduates and postgraduates, were asked to work through the cards.
- Task of the students: to select out the five statements with which they i) *immediately* agreed most strongly and ii) *immediately* disagreed most strongly.
- Nine statements, which the students did not select for either category, were eliminated.

Stage 4:

- The 24 statements distilled in *Stage 3* provided the first form of the 'Perry' questionnaire. Responses to the questionnaire were to be given by indicating degree of agreement/disagreement with statements on a 6-point scale based on a Likert format:

6 = *strongly agree* 5 = *agree* 4 = *probably agree*

3 = *probably disagree* 2 = *disagree* 1 = *strongly disagree*

- A mid-point or 'neutral' score was omitted from the scale in an attempt to encourage students in one direction or the other.
- The questionnaire instructions asked respondents for an 'immediate reaction' to each statement, while stressing that there was no right or wrong response.

Stage 5:

- This draft questionnaire consisting of 24 statements was piloted with a group of part-time undergraduates in their second and fifth years of study.
- The pilot study identified a number of statements which were not successful in discriminating between students, since all students gave the same response of agreement or disagreement. These statements were excluded from the questionnaire.
- One or two statements, the content of which resembled others in the questionnaire but which discriminated less sharply amongst students, were also eliminated.
- At the end of the pilot study, 18 statements remained, with six associated with each of the 'A', 'B' and 'C' positions.

Stage 6:

- This stage was concerned with testing the validity of the final 18 'Perry' statements. The aim was to verify the original classification of statements carried out in *Stage 2* and the discriminant potential of the 18 statements. A panel of 15 judges who were familiar with the Perry scheme was used.

- **Task of the judges:** to categorise each of the 18 statements according to whether they thought a student at an 'A', 'B' or 'C' stage was likely to agree or disagree with it. Judges were given a description of the characteristic approaches associated with each of these positions.
- **Results:** the panel of judges agreed with the original classification of statements (*Stage 2*) in relation to those students who were likely to agree with each of the statements but they did not reach a consensus on those students who were likely to disagree with each statement. Harvey concluded that this supported her decision, in relation to the scoring of the questionnaire responses, to count only the 'agree' responses and discount the 'disagree' responses. (This point is discussed more fully in Chapter 7, with reference to calculating 'distance from A' scores from the 'Perry' questionnaire in order to correlate responses with personality scores derived from the *NEO-FFI*.)

Harvey's 'Perry' questionnaire was used as the basis for the learning perceptions questionnaire in the current study. Where appropriate, the wording of the questions was amended to include reference to *medical* sciences. Also further work on the questionnaire in the Centre for Science Education, University of Glasgow had led to a reduction in the number of statements from 18 to 15. Before the content of the questionnaire was finalised, drafts were discussed with staff in the Medical Education Unit and with a student representative from the Medical Staff-Student Committee.

The questionnaire finally devised for this study, then, consisted of three main sections which asked students about their perceptions of learning. The first section comprised four sentence completion items to which students were asked to choose one of three answers to each item. The four sentence stems were as follows: *'My job as a student is*'; *'I think that the lecturer's job is*'; *'I think that knowledge is*'; and *'My job in my exam is*'. These had been used in another recent study in the Centre for Science Education of undergraduate Biology students (Katunga, Johnstone and Downie, 1999).

The second section comprised a series of fifteen statements (based on Harvey's 'Perry' questionnaire, discussed above) which were related to aspects of undergraduate studying and learning. Most reflected one or more of the sentence completion items, for example, *'I think it is the responsibility of the lecturer to give me all the information I need to pass the exam'*; *'I like exams which give me an opportunity to show I have ideas of my own.'* Respondents were asked to indicate the extent of their agreement with each statement on a five-point scale where 5 = *Strongly Agree*, 4 = *Agree*, 3 = *Neutral*, 2 = *Disagree*, and 1 = *Strongly Disagree*.

The third section consisted of three statements, two of which were selected from the series of fifteen in the second section. For each statement, respondents were asked to indicate simply whether they *'Agreed'* or *'Disagreed'* but, in addition, they were asked to justify their answer briefly.

To test the clarity of the phrasing of statements in the questionnaire and also to gain an indication of how long it would take students to complete it, the questionnaire was piloted with a first year undergraduate student who was not studying in a medical curriculum but was in a heavy and demanding course at another university.

The above describes the basic framework of the questionnaire about learning perceptions. However, there were a few differences in detail between the questionnaires given out at the beginning and the end of first year. Also a few amendments were made in the end-of-year questionnaire distributed to the cohort of students in the problem-based course.

The questionnaire issued to both cohorts in Term 1 of first year (Appendices 1.1 and 1.2) also requested information about the student's date of birth, gender, educational qualifications, and whether the student had progressed to the university medical course in the session immediately after leaving school (Appendices 1.1 and 1.2, Questionnaire: SECTION A). The four sentence stems, together with their associated forced-choice responses, were presented in the Term 1 version of the questionnaire in the form of a grid (Appendices 1.1 and 1.2, Questionnaire: SECTION B 1). In addition, students were asked to respond to the sentence stems as they thought they might have done prior to their coming to university (Appendices 1.1 and 1.2, Questionnaire: SECTION B 2). It can be argued (e.g. Clark and Anderson, 1992) that retrospective accounts such as these are less valid than concurrent ones but it was considered that, since most of the students were being asked to reflect on a lengthy

period of schooling which had ended only about four months before, such retrospective impressions would still be informative.

The form of the questionnaire distributed in Term 3 of first year (Appendices 1.3 and 1.4) excluded the demographic section and the request for a retrospective response to the four sentence stems but, in response to feedback from the Medical Staff-Student Committee, the layout of the questionnaire was redesigned and a single sheet for students' comments was inserted. The students could use this sheet to expand on any of their answers or to comment about their experience as a first year medical student. For example, they might refer to the extent to which they had found first year easier or more difficult than expected, or much in line with expectations; with the benefit of hindsight, in what ways, if any, would they have approached first year differently; and whether they considered they had changed their methods of learning or studying in any way during their first undergraduate year.

Finally, the last section of the questionnaire originally contained three statements with which respondents were asked to 'Agree' or 'Disagree' and also to justify their decision. From the responses in the Term 1 questionnaire of students in the traditional course, it was clear that the third question – *'When I meet a new idea in the course, I try to relate it to things I have met in other parts of the course'* - was of limited value, since all respondents agreed with the statement and gave similar justifications. This question, therefore, was excluded from subsequent questionnaires.

For response comparison, it was important that the first year Term 1 and Term 3 questionnaires be as similar as possible for the two cohorts of students. Thus students in the traditional course and in the PBL course received the same Term 1 questionnaire. However, about 10% of the respondents in the problem-based course provided written feedback on their questionnaires that emphasised the need for the minor re-wording of one or two of the questions to take into account more explicitly the problem-based nature of their course. This re-wording involved, for instance, changing a term such as 'lecturer' to 'member of staff' and including the term 'assessment' in questions that asked about examinations (Appendix 1.4).

3.3.2 Semi-structured interview

The general aim of the recorded individual interviews was to explore, in more depth than is possible in a structured questionnaire, the students' perceptions of their learning experience as medical undergraduates. More specifically, the questions in the interview schedule (Appendix 2.2) reflected recurring issues that had emerged from students' comments on the sheet enclosed with the 'learning perceptions' questionnaire in Term 3 of first year, such as the volume of workload, the extent to which the amount of work required had been anticipated prior to coming to university, the student's levels of confidence in passing at different stages of the course, and possible changes in the student's motivation to become a doctor.

In addition, students were asked i) general questions about their approaches to studying both at school and at university and about the extent to which they considered their current approaches were effective and ii) to indicate on a checklist the frequency with which they used specific approaches to prepare for examinations, for instance, *'I try to understand new material by trying to link it to what I already know or to my past experience'*; *'I try to learn most of the material "off by heart".'* (Appendix 2.3). The items in the checklist were based on those devised in an earlier study of approaches to studying used by adult returners (Mackenzie, 1990), which had been drawn up on the basis of the literature on test anxiety (e.g., Folkman and Lazarus, 1985; Mechanic, 1978; Rost and Schermer, 1987).

Finally, students were asked to complete a second checklist (Appendix 2.4), in which they rated the extent to which they thought their medical course, in general, had been characterised by a number of features, such as *'Learning of details'*, *'Integrating different subjects or topics in order to solve problems'* and *'Thinking independently'*. The items included in this second checklist were selected from those devised by Mårtenson *et al* (1992) and also used by Kaufman and Mann (1996a), who compared two cohorts of medical students at the end of their second year, in terms of the students' perceptions of their pre-clinical curricula (see Chapter 2). The first cohort was following a conventional, lecture-based programme while the second was following a new, problem-based learning curriculum. Students in the latter believed that their pre-clinical medical course prompted higher-level thinking, the management of information and self-directed learning, and stimulated them to articulate previous

knowledge and to integrate knowledge. In contrast, students in the conventional curriculum reported that these features were less typical of their courses and they believed that there was a heavy emphasis on the learning of details. The PBL students perceived that, in addition to the learning of content, they were acquiring skills that would be widely applicable, for instance, self-directed learning and metacognitive skills

The interview checklists were piloted with the undergraduate student who piloted the draft form of the learning perceptions questionnaire. Amendments were made to the wording in one or two items and the list of course features in the second checklist was reduced from the original twelve to ten.

3.3.3 The NEO Five-Factor Inventory (*NEO-FFI*), Form S (Costa and McCrae, 1991)

The *NEO Five-Factor Inventory (NEO-FFI)* is a 60-item version of the 240-item *NEO Personality Inventory (NEO PI)*; the revised version is known as the *NEO PI-R*. The latter was developed by Costa and McCrae as a measure of the 'Big Five' personality factors described in Chapter 2. The *NEO-FFI* is a self-report measure of five dimensions of personality - neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness - and is more appropriate than the more extensive *NEO PI-R* when more global but less detailed information on personality is

sufficient and also when the time available for completion of an inventory is limited. In the current study, the researcher did not wish to disturb the teaching and learning sessions for longer than was essential, especially since the students in the PBL course had already completed numerous evaluation questionnaires during the first two years. It was thought that students were more likely to be prepared to spend 10-15 minutes of their time completing a 60-item questionnaire than considerably longer answering a 240-item questionnaire and, perhaps, completing a shorter version a little more carefully. These reasons, therefore, together with theoretical grounding of the inventory in the five-factor model of personality, the *NEO-FFI* was considered a useful means for gathering information about the medical students' personality ratings. A copy of the inventory is included in Appendix 3.2). For each of the 60 items in the questionnaire, respondents indicate the extent to which they agree or disagree on a five-point scale ('*Strongly disagree*', '*Disagree*', '*Neutral*', '*Agree*', '*Strongly Agree*'). There are twelve items to measure each dimension. The five dimensions are described as follows (Costa and McCrae, 1992).

'N': *Neuroticism* represents a dimension where adjustment, or emotional stability, is at one end of a continuum and maladjustment, or neuroticism, is at the other. Those with low scores on *Neuroticism* are regarded as emotionally stable: they are usually even-tempered, relaxed and able to cope with stressful situations. In comparison, those who score highly on the *N* scale tend to experience negative emotions, e.g., sadness, anger, guilt, embarrassment, and to cope more poorly with stress.

- 'E': Extraverts, those at one end of the *Extraversion* dimension, are sociable, active, talkative, and optimistic, liking excitement and stimulation, and preferring large groups of people. Introverts, at the other end of the continuum, are independent, reserved, even-paced, and prefer to be on their own.
- 'O': *Openness to experience* consists of the following elements: active imagination, aesthetic sensitivity, intellectual curiosity, independence of judgement, a preference for variety, and an awareness of inner feelings. Those scoring highly on this scale are thought to be divergent thinkers, willing to entertain novel ideas and unconventional values, and willing to question authority. In contrast, individuals with low scores on Openness are described as conventional and conservative in their attitudes and their emotional responses are less intense.
- 'A': The *Agreeable* person is basically altruistic, wanting to help others and expecting that other people will be equally helpful, in comparison with the individual scoring low on this scale, who will be antagonistic, egocentric, and competitive rather than cooperative.
- 'C': On the fifth dimension - *Conscientiousness* - conscientious individuals are thought to be determined, strong-willed and achievers in academic and occupational terms. Individuals at the other end of this continuum are more

lackadaisical in working towards their goals and, although they do not necessarily lack moral principles, they are less exacting in applying them.

Considerably more work has been carried out to establish the reliability and validity of the full inventory, the *NEO PI-R*, than for the short version, the *NEO-FFI*, which was used in this study. However, some supporting evidence is available and, as Costa and McCrae (1992) pointed out:

‘As subsets of NEO PI-R domain scales, NEO-FFI scales carry with them some portion of the demonstrated validity of the full scales. The major question is how much of a reduction in validity is to be expected, given the shortening of the scales.’

(1992: 53)

The *NEO PI-R* scales themselves have been shown to have good reliability and have demonstrated validity with other personality instruments and across various sources of data, such as ratings by self, by spouses, and by peers (Pervin and John, 1997). The extent to which the *NEO PI-R* correlates with other personality instruments has been important in order to assess its validity. There seems to be considerable evidence that *NEO PI-R* scores correlate well with the following: other questionnaires based on ‘factor’ models, such as Eysenck’s inventories and Cattell’s 16PF; with other forms of personality measurement, such as *Q*-sort ratings (ratings based on a series of statements, ranging from those that are least descriptive to most

descriptive); and with questionnaires based on other theories of personality (Pervin and John, 1997).

The approach that is used most frequently to measure the reliability of a test or questionnaire is to establish its internal consistency – the extent to which test items intended to reflect the same trait correlate with each other – and its test-retest reliability – the extent to which individuals' scores are the same on different occasions. Internal consistency is usually calculated as coefficient alpha, which is determined by the average intercorrelations of items on a scale and the number of items. Coefficient alphas of the *NEO-FFI* as measures of its internal consistency, have been found to be smaller than those for the corresponding *NEO PI-R* scales but are still acceptable, ranging from 0.68 to 0.86. In terms of its validity, correlations between the five scales of the *NEO-FFI* and an earlier measure of the five-factor model based on adjective self-reports have shown acceptable levels of correlation, ranging from 0.56 to 0.62 (Costa and McCrae, 1992).

ANALYSES OF THE LEARNING PERCEPTIONS QUESTIONNAIRE I

COHORT RESPONSE PATTERNS: SENTENCE STEMS

4.1 Introduction

Described initially in this Chapter are the response rates associated with the learning perceptions questionnaire. Details of the response rates for the personality inventory, the *NEO-FFI*, are reported in Chapter 7. Subsequently in this Chapter and in Chapters 5 and 6 are reported the analyses of responses to the main sections of the questionnaire devised to investigate students' perceptions of learning (Appendix 1). These main sections consisted of the four sentence stems, each of which had three fixed-response options, and the list of 15 statements in which respondents were asked to indicate the extent of their agreement or disagreement. This Chapter focuses on *cohort* patterns of response to the first of these main sections, the four sentence stems.

4.2 Response rates for the learning perceptions questionnaire

Table 3 shows the response rates for the learning perceptions questionnaire for each separate occasion on which they were distributed in first year and for both occasions taken together.

Table 3 Response rates associated with learning perceptions questionnaire

	Number returned		Response rate	
	Tradit. course	PBL course	Traditional * Course	PBL ** course
<i>Learning perceptions questionnaire:</i>				
At beg. of Year 1	169	192	71% of 237	82% of 235
At end of Year 1	176	166	74% of 237	71% of 235
On both occasions	126	134	53% of 237	57% of 235

*237 students were enrolled in the first year of the traditional course when the first learning perceptions questionnaire was distributed

**235 students were enrolled in the first year of the PBL course when the first learning perceptions questionnaire was distributed

For both cohorts, the separate response rates for Term 1 and Term 3 questionnaires are high. It was to be anticipated that the response rates for those who returned the questionnaires on *both* occasions would be lower. The rates obtained for the two Terms combined are somewhat lower than might have been desired. However, these rates are still acceptable in the context of survey research.

4.3 Responses to the sentence stems: between-groups and within-groups comparisons

Responses to the sentence stems provide a general but useful starting-point for comparisons of the traditional and PBL cohorts of students and for studying each cohort within its own right. In this Chapter, data from responses to the sentence stems have been analysed to provide information about two kinds of comparison. The first is a comparison of responses to the sentence stems given by students in the traditional and PBL courses (Table 4). This between-groups comparison was made at each of three points in time: pre-university, by means of retrospective gauging of likely answers to the sentence stems in the period prior to coming to university; near the beginning of the first undergraduate year (in the middle of the first term); and near the end of the first undergraduate year (in the middle of the third term).

Table 4 Between-groups comparisons at three points in time: responses to sentence stems

Cohorts of students compared in analyses	Stage in undergraduate course at which the comparison was made
i) Traditional vs PBL students	Pre-university (retrospective recall at beginning of Year 1 (Term 1))
ii) Traditional vs PBL students	Beginning of Year 1 (Term 1)
iii) Traditional vs PBL students	End of Year 1 (Term 3)

The second comparison, a within-groups comparison, consisted of making a separate examination of the responses of the students in each of the two courses (Table 5). This involved tracing, within each group, possible changes in the group's responses across the same three points in time: pre-university → beginning of first year → end of first year.

Table 5 Within-group comparisons at three points in time: responses to sentence stems

Cohort of students studied in analyses	Stage in undergraduate course at which perceptions were reported by students
i) Traditional students	<p style="text-align: center;">Pre-university</p> <p style="text-align: center;">↓ vs</p> <p style="text-align: center;">Beginning of Year 1 (Term 1)</p> <p style="text-align: center;">↓ vs</p> <p style="text-align: center;">End of Year 1 (Term 3)</p>
ii) PBL students	<p style="text-align: center;">Pre-university</p> <p style="text-align: center;">↓ vs</p> <p style="text-align: center;">Beginning of Year 1 (Term 1)</p> <p style="text-align: center;">↓ vs</p> <p style="text-align: center;">End of Year 1 (Term 3)</p>

The between-groups comparisons (Section 4.4) included non-parametric statistical analyses whilst the within-groups comparisons (Section 4.5) were based on inspection of bar charts and descriptive statistics.

The sentence stems from the learning perceptions questionnaire were as follows:

My job as a student is ...

I think the lecturer's job is ...

(amended to *I think that the job of members of staff is ...* in the
Term 3 questionnaire for the PBL students)

I think that knowledge is ...

My job in my exam is ...

(amended to *My job in assessments and exams is ...* in the
Term 3 questionnaire for the PBL students)

Students were asked to respond to each stem by endorsing one of three statements, which reflected an 'A'-type, 'B'-type or 'C'-type of perception, derived from Perry's scheme of cognitive and ethical development development (Chapter 2). The statements are shown in the learning perceptions questionnaire (Appendix 1).

It is important to note that, in these initial analyses described below, no account is being taken of the extent to which *individual* students changed or did not change over

time. Such analyses of changes in individuals' responses are reported in Chapter 5. Instead, the analyses reported here are simpler and relatively crude, focusing on *overall group* patterns at given points in time.

4.4 : Between-groups comparisons of perceptions reported i) prior to university, retrospectively; ii) at the beginning of first year; iii) at the end of first year

4.4.1 'Pre-university' perceptions

The percentages of each cohort of students who endorsed an 'A', 'B' or 'C'-type of statement in response to each of the four sentence stems are shown in Figures 1 to 4. The category, 'Missing', refers to those students who did not give a response to that particular stem; 'BC' refers to students who endorsed two statements, a 'B' and a 'C' statement. In addition, chi-square analyses of the responses to each sentence stem were carried out in order to determine whether traditional and PBL students reported significantly different types of perceptions. The raw data on which the chi-square analyses were carried out are shown in Tables i-iv in Appendix 4.

The two cohorts of students did not differ significantly in their 'pre-university' perceptions of the student's role, the job of staff, the nature of knowledge, or the student's task in exams/assessments: Role of student: $\chi^2=4.93$, $df=3$, $p=0.18$; Role of

staff: $\chi^2=5.56$, $df=4$, $p=0.24$; Nature of knowledge: $\chi^2=0.39$, $df=3$, $p=0.94$; Task in exams/assessments: $\chi^2=1.45$, $df=3$, $p=0.69$.

The kinds of views held by traditional and PBL students about the roles of students and lecturers/members of staff, though not identical, are similar in that they are spread fairly evenly over 'A', 'B', and 'C' positions within both student cohorts. When asked to reflect back to a period of about three months before coming to university, to a time when most were completing school studies, and to describe what they thought their views were at that stage, traditional and PBL students did not differ significantly in the kinds of views they thought they had held then.

In relation to the student's role (Figure 1), slightly more than 60% of students in each course endorsed 'B' or 'C'-type statements: *'To accept that some responsibility rests on me for learning, but I am not sure what is expected of me about what or how to learn.'* ('B'-type statement); *'To accept what is given, but to think about it critically, to check other sources for myself and to take responsibility for what and how I learn.'* ('C'-type statement). A large minority (28% of traditional students; 32% of PBL students) endorsed the 'A'-type statement, namely, *'To accept the information given to me by the lecturer without question and to learn it.'*

In the case of the role of members of staff (Figure 2), almost identical percentages of traditional (40%) and PBL (39%) students agreed with the 'C' statement, *'To provide me with information but I realise the lecturer is not the only source of information and that I can find things out for myself to supplement what the lecturer has given.'*

Again, however, a sizeable minority in each cohort (25% of traditional students; 34% of PBL students) agreed with the 'A' statement, that they saw the job of members of staff as one of *'giving me all I need to know for the exams and to avoid any extra non-examinable material.'*

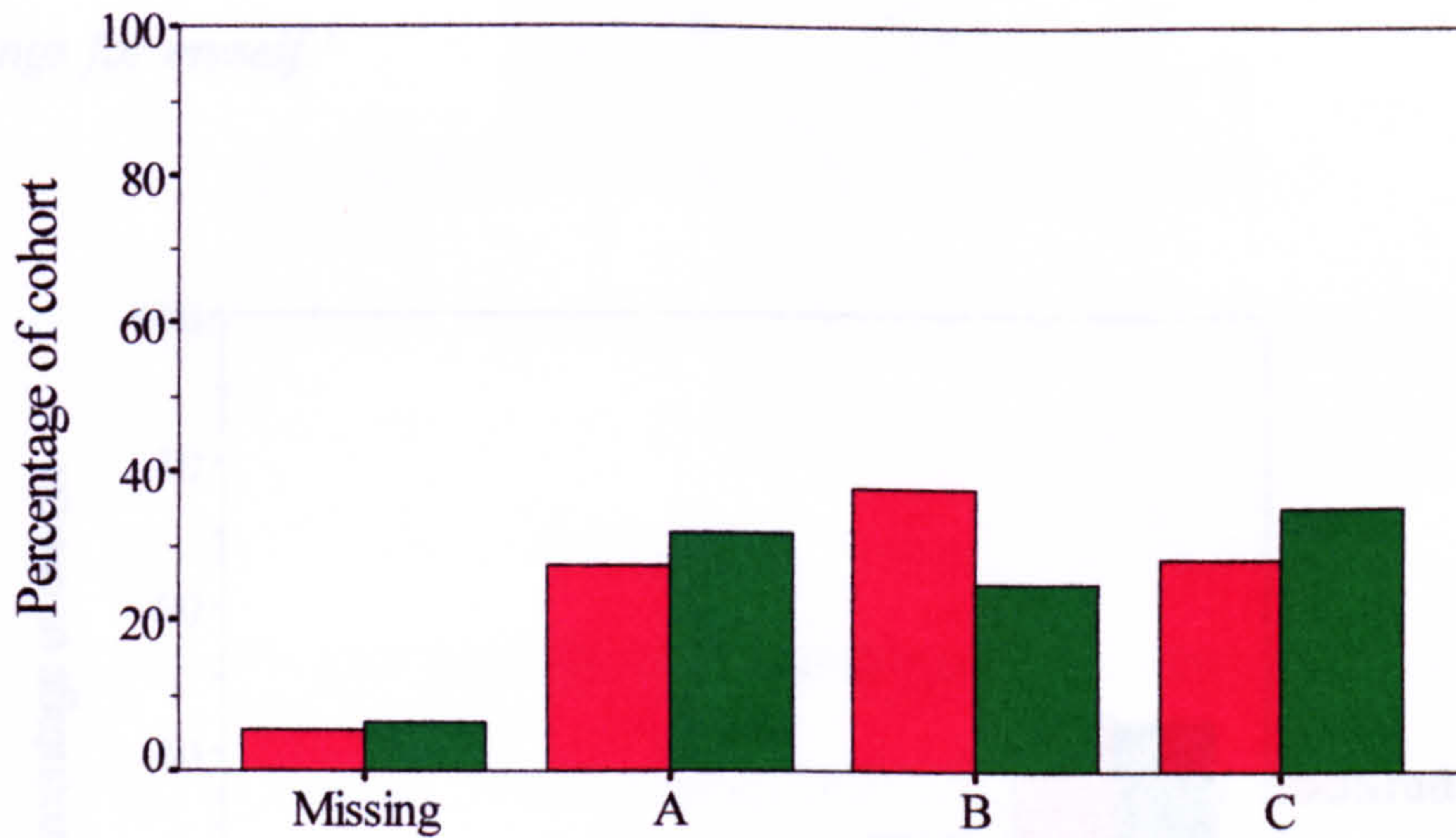


Fig. 1 'Pre-university' perceptions of the student's role

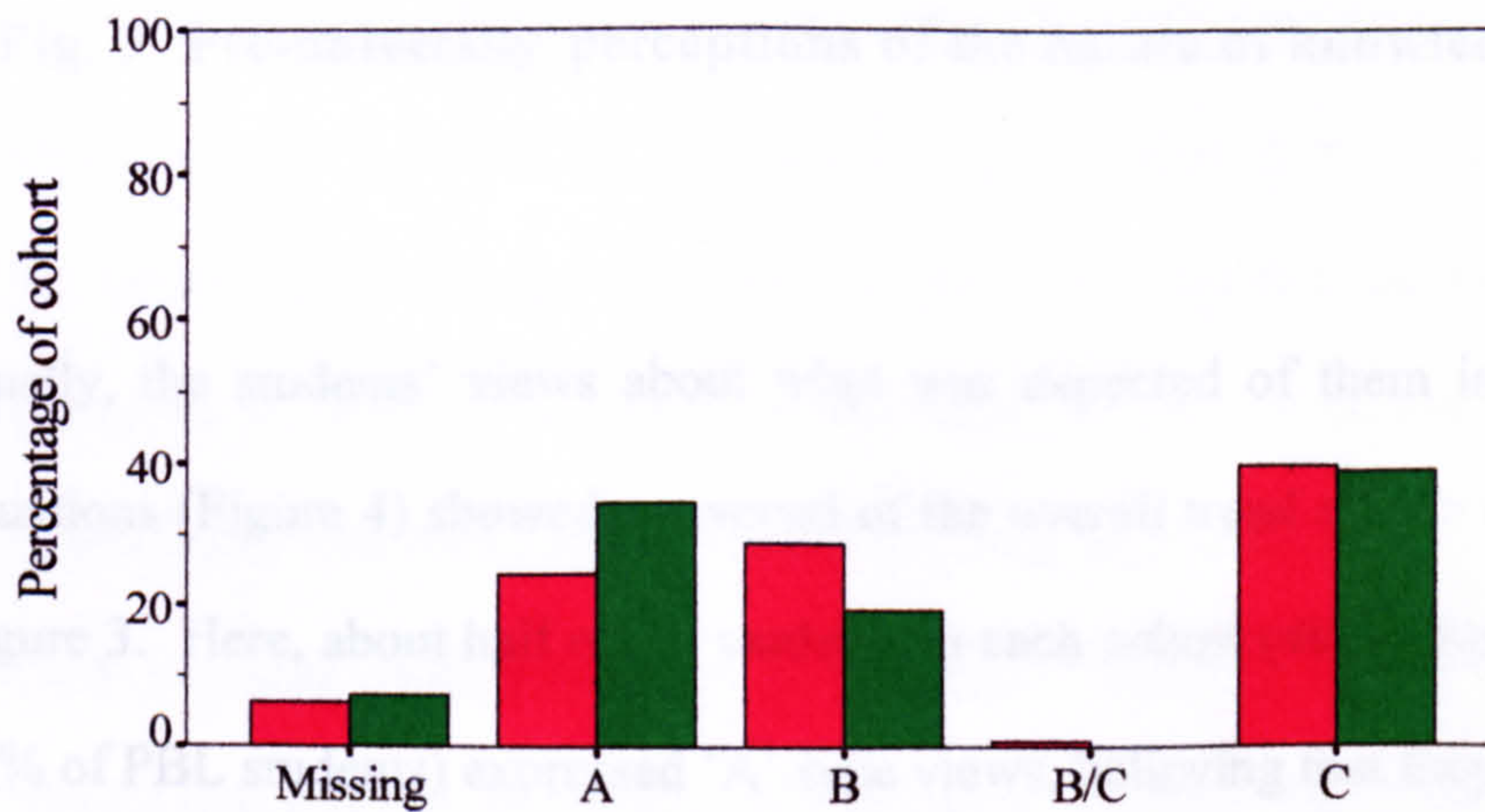


Fig. 2 'Pre-university' perceptions of the role of staff

- Students in the traditional course
- Students in the PBL course

The students' retrospective reports about their perceptions of the nature of knowledge (Figure 3) presented an almost identical pattern within the two cohorts, with approximately half of the students (45% of traditional students; 44% of PBL students) seeing 'knowledge' from a 'C'-type perspective, that is, *'Complex and by no means black and white, but I find this exciting and stimulating. It makes me want to explore things for myself.'*

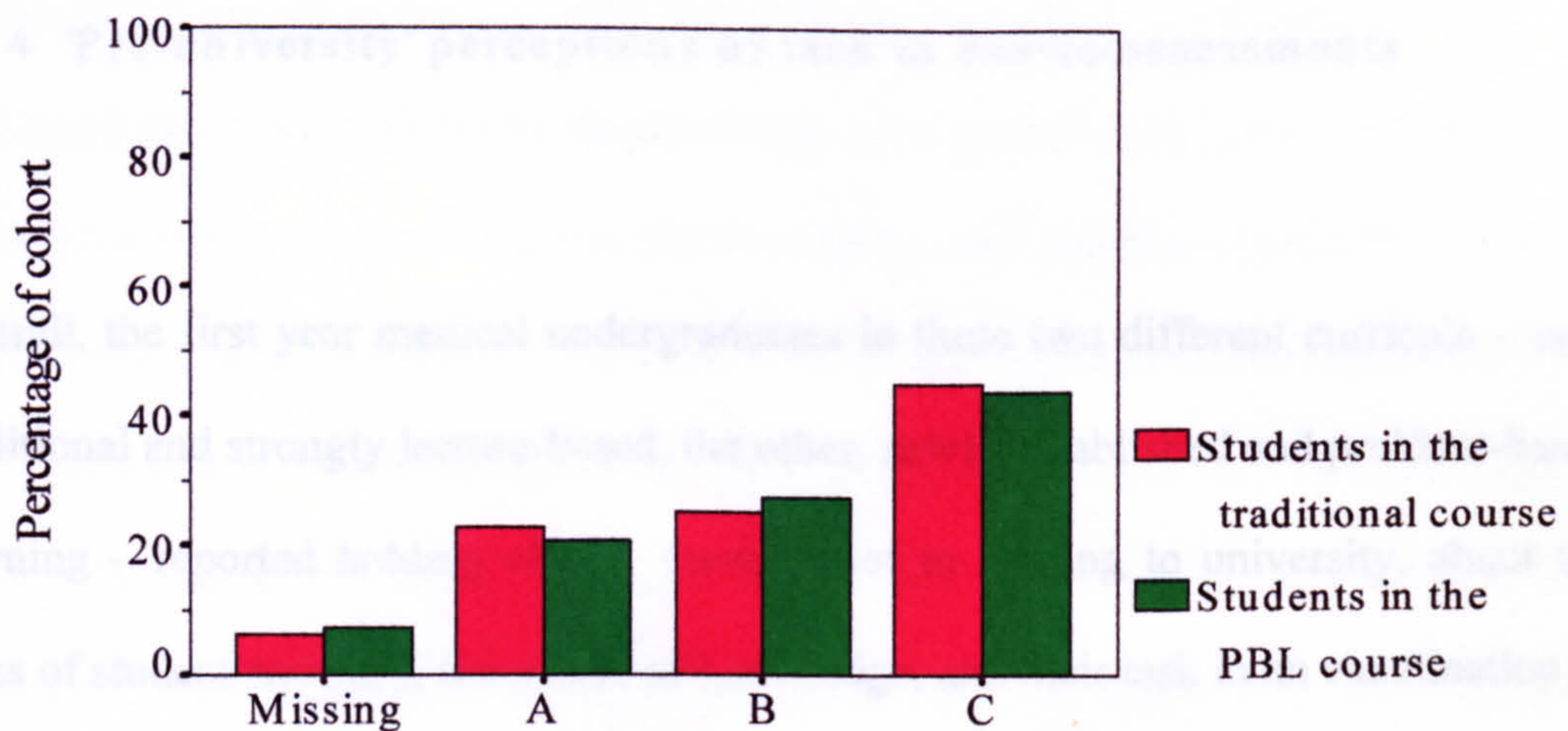


Fig. 3 'Pre-university' perceptions of the nature of knowledge

Finally, the students' views about what was expected of them in exam/assessment situations (Figure 4) showed a reversal of the overall trend shown for 'knowledge' in Figure 3. Here, about half of the students in each cohort (49% of traditional students; 46% of PBL students) expressed 'A'-type views, believing that they should *'give back the facts I have learned as accurately as possible'* and that they preferred *'questions with single clear-cut answers rather than open long questions.'*

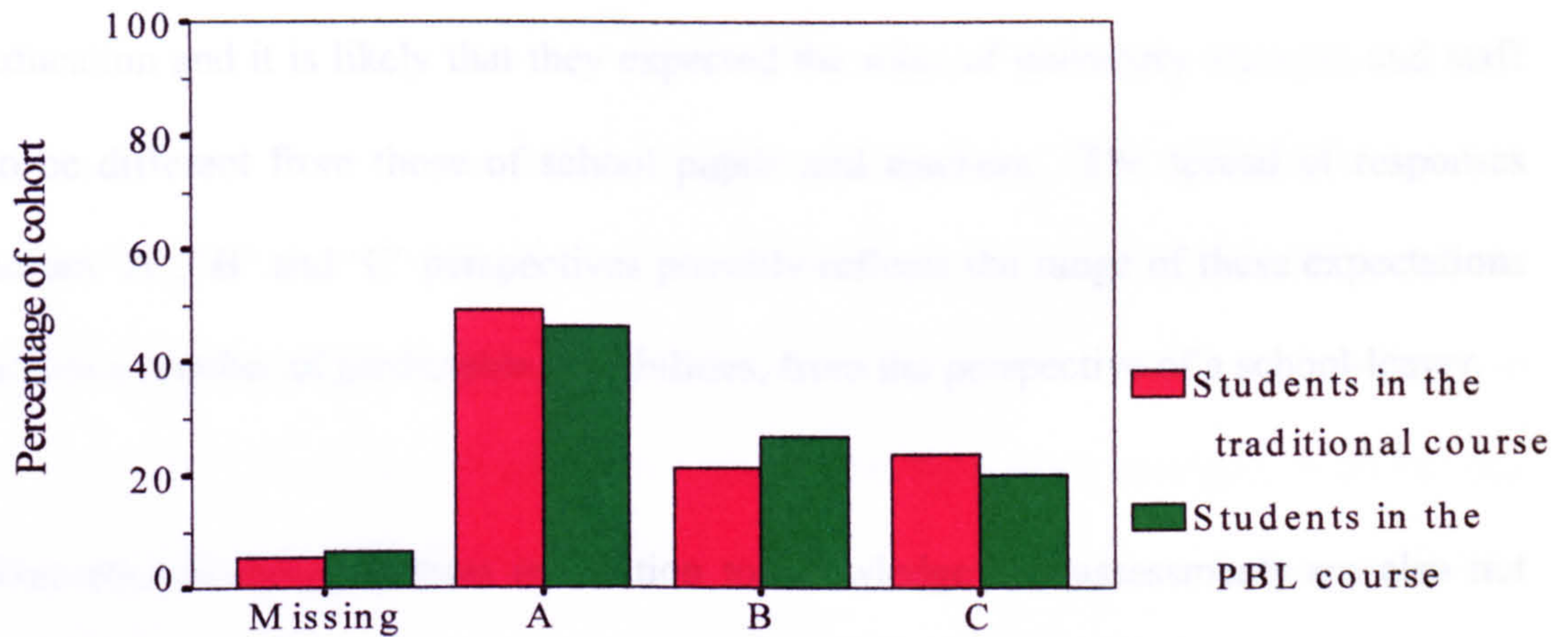


Fig. 4 'Pre-university' perceptions of task in exams/assessments

Overall, the first year medical undergraduates in these two different curricula – one, traditional and strongly lecture-based, the other, newly-established and problem-based learning – reported holding similar views, prior to coming to university, about the roles of student and staff, the nature of knowledge, and their task in an examination or assessment. Their views about student and staff roles reflected a more or less even spread of responses across 'A', 'B' and 'C' perspectives but, in contrast, perceptions of the nature of knowledge and assessment-related tasks were rather more sharply polarised, in 'C' and 'A' positions respectively. Since one would expect the roles of undergraduates and members of staff to be seen as reciprocal, it is not surprising to find that students' responses show similar distributions in these two areas. Nor is it surprising that there is an absence of clustering of these responses in one of the 'A', 'B' or 'C' positions. The great majority, though not all, of the students in both

courses had recently left school and had had no previous experience of higher education and it is likely that they expected the roles of university students and staff to be different from those of school pupils and teachers. The spread of responses across 'A', 'B' and 'C' perspectives possibly reflects the range of these expectations across a number of predictable possibilities, from the perspective of a school-leaver.

The retrospective responses in relation to knowledge and assessments are also not unexpected. In comparison with learning at school, progression to study at undergraduate level is likely to be associated with greater complexity of knowledge and more avenues for searching out that knowledge, and possibly greater freedom and time to explore knowledge fields, at a time before undergraduates experience the reality of the pressures of workload and time. Such expectations may be reflected in a slight polarisation of 'C'-type responses. In contrast, it seems that many students still expected to be tested on this more complex body of knowledge in a simple, straightforward 'giving back of the facts', as shown by a concentration of 'A'-type responses to the sentence stem about exams and assessments.

In general, the students in both the traditional and problem-based courses would seem to have started from a similar pre-university baseline, in terms of the views they reported about these four elements of their undergraduate learning experience.

4.4.2 Perceptions at the beginning of Year 1 (Term 1)

As can be seen from the bar charts in Figures 5 to 8, at this point early in the first year, the general trend of responses within each cohort of students is different from that characterising the retrospective accounts. This is especially the case in relation to perceptions of student and staff roles. In addition, there have emerged, in all but one of the areas (perceptions of the nature of knowledge), significant differences in the types of responses given to the sentence stems by the traditional and PBL students. The data on which the chi-square analyses were carried out are shown in Tables v-viii in Appendix 4.

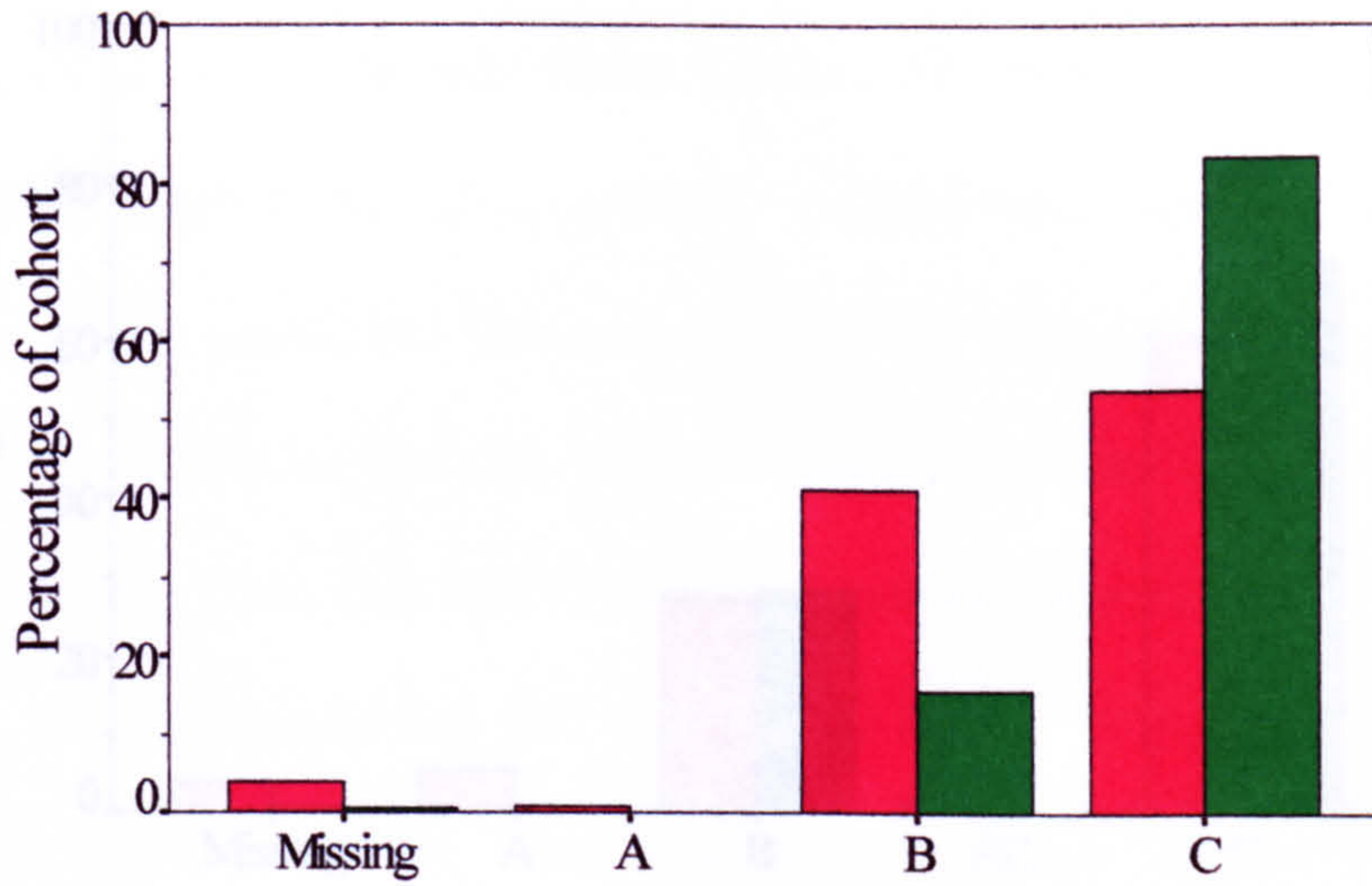


Fig 5 Perceptions of the student's role: Term 1, Year 1

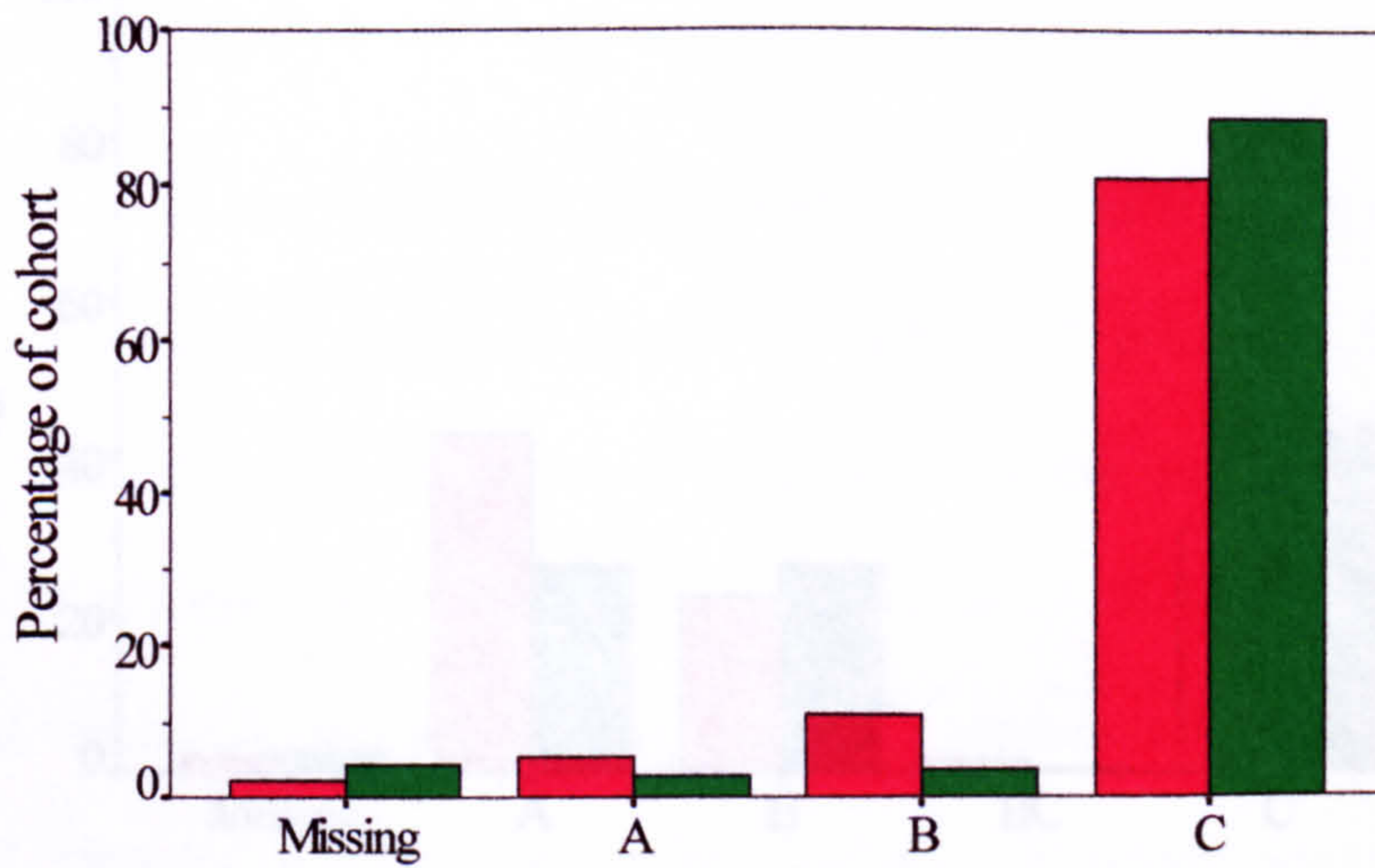


Fig 6 Perceptions of the role of staff: Term 1, Year 1

- Students in the traditional course
- Students in the PBL course

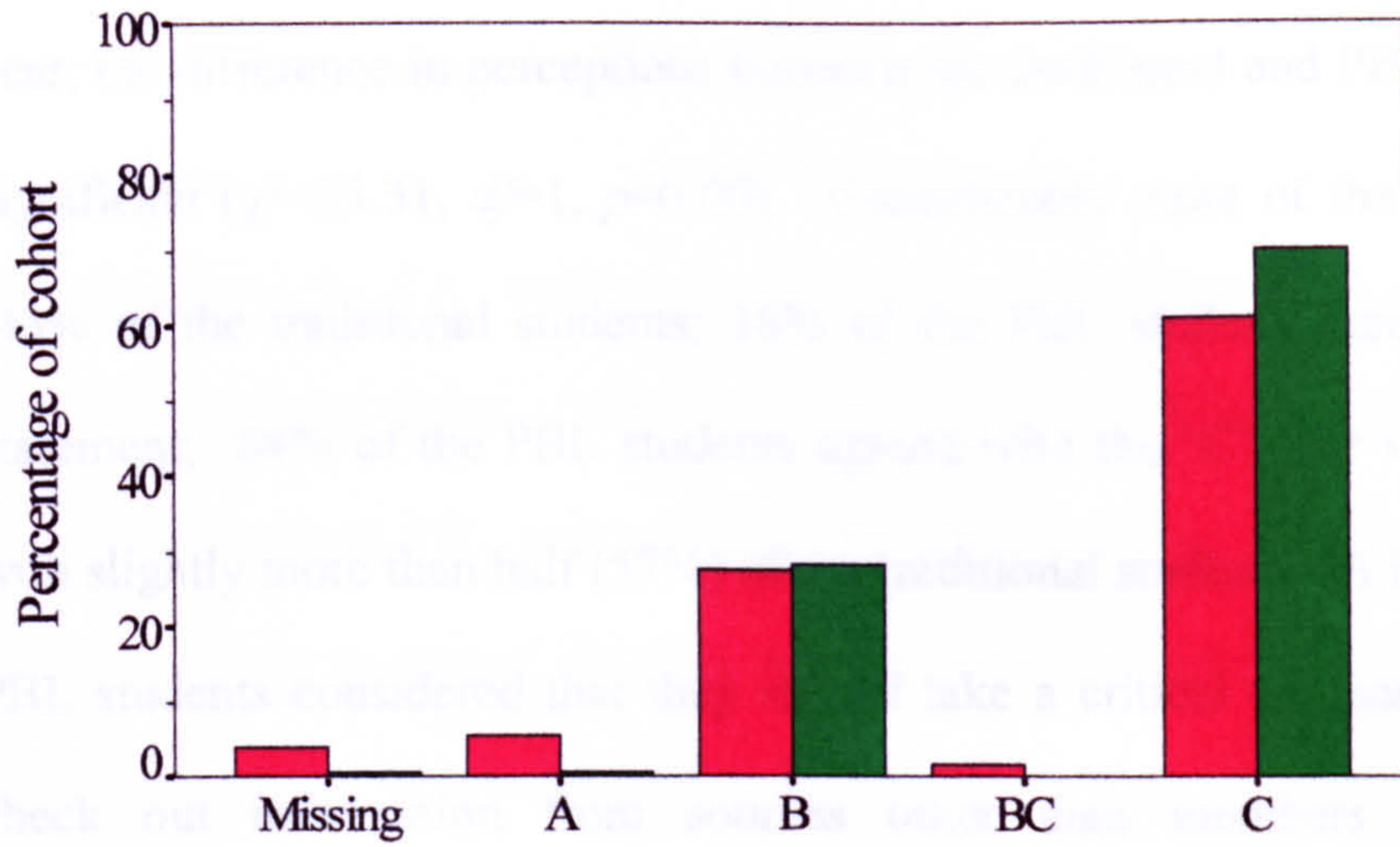


Fig 7 Perceptions of the nature of knowledge: Term 1, Year 1

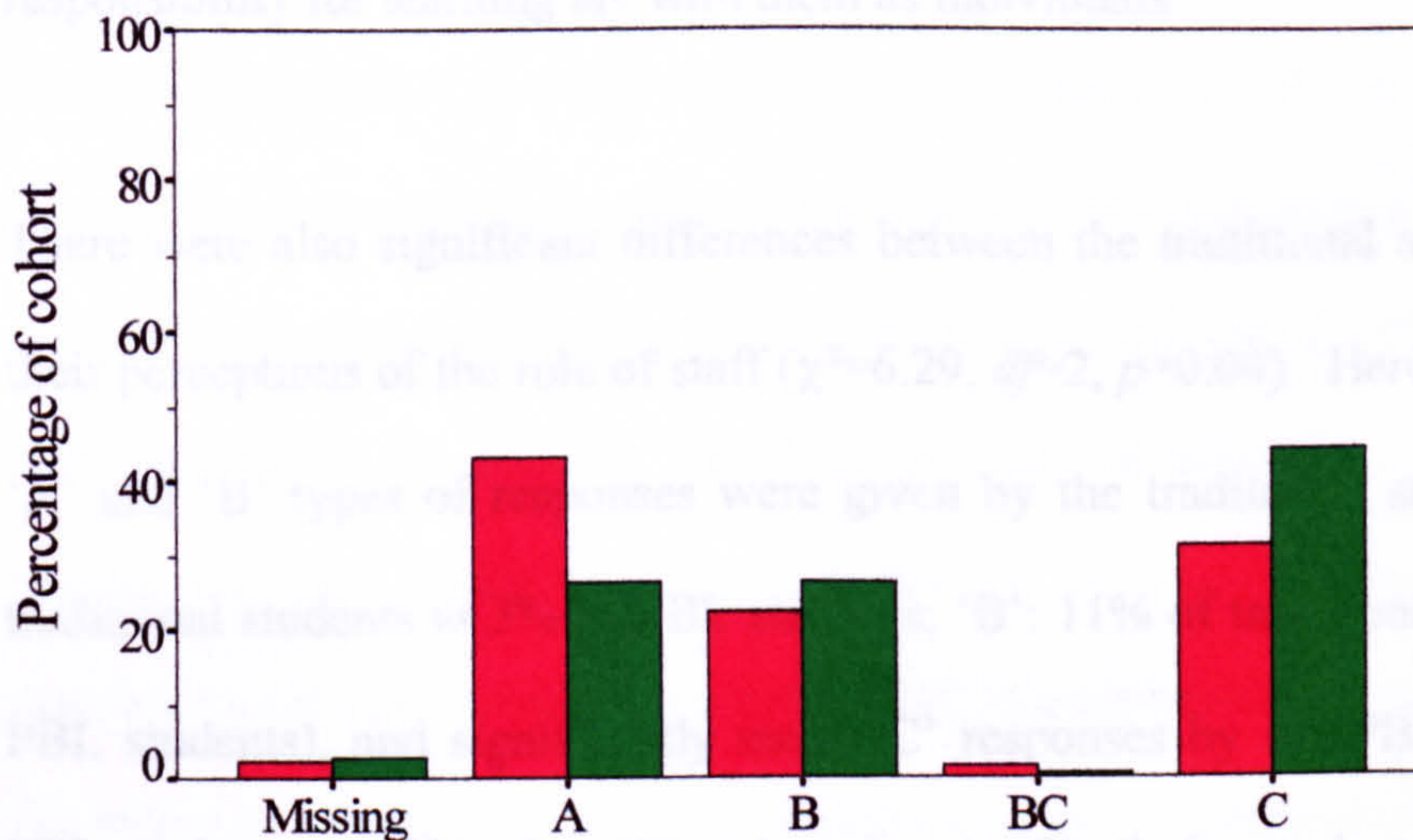


Fig 8 Perceptions of task in exams/assessments: Term 1, Year 1

- Students in the traditional course
- Students in the PBL course

In terms of how the student's role is viewed in the middle of the first term of first year, the difference in perceptions between the traditional and PBL students is highly significant ($\chi^2=23.31$, $df=1$, $p=0.00$). Considerably more of the traditional students (43% of the traditional students; 16% of the PBL students) endorsed the 'B'-type statement; 84% of the PBL students agreed with the 'C'-type statement, compared with slightly more than half (57%) of the traditional students. A large majority of the PBL students considered that they should take a critical approach to their subjects, check out information from sources other than members of staff and take responsibility for what and how they learned. While this approach is also reported by many of the traditional students, a sizeable proportion of them reported being uncertain about what or how they should learn, at the same time accepting that some responsibility for learning lay with them as individuals.

There were also significant differences between the traditional and PBL students in their perceptions of the role of staff ($\chi^2=6.29$, $df=2$, $p=0.04$). Here, significantly more 'A' and 'B' types of responses were given by the traditional students ('A': 6% of traditional students vs 3% of PBL students; 'B': 11% of traditional students vs 4% of PBL students), and significantly more 'C' responses by the PBL students (93% of PBL students vs 83% of traditional students). Similarly, students in the two courses differed significantly in what they thought was expected of them in exams/assessments ($\chi^2=8.67$, $df=2$, $p=0.01$). Just under half (45%) of the traditional group, compared with about a quarter (27%) of the PBL group, reported 'A' views.

On the other hand, just under a half (46%) of the PBL group reported 'C' perceptions, compared with about a third (32%) of the traditional group of students.

In only one of the four elements of the students' learning experience – perceptions of the nature of knowledge – were there no significant differences between students in the traditional and PBL courses ($\chi^2=1.03$, $df=1$, $p=0.31$). 70% of the PBL students and 61% of the traditional students regarded knowledge from a 'C' perspective, while almost all of the remainder expressed 'B'-type views. Very few students in either course supported an 'A' type of response.

Although retrospective reports about their 'pre-university' positions in relation to these four elements associated with teaching and learning did not distinguish between students in the traditional and problem-based courses, significant group differences in three of these elements were demonstrated at a point seven weeks into the first term of the first undergraduate year. The direction of the group differences – 'C'-type responses being reported by higher proportions of students in the problem-based course – is that which one would expect to be more closely associated with a problem-based curriculum than a traditional, lecture-based one, especially in terms of the extent to which students see themselves as more independent, analytical learners rather than passive, unquestioning recipients of information that is 'handed down' to them.

4.4.3 Perceptions at the end of Year 1 (Term 3)

Figures 9 to 12 illustrate the types of responses given by the students in the two courses near the end of their respective first years of study as medical undergraduates. The data on which the chi-square analyses were carried out are included in Tables ix-xii in Appendix 4.

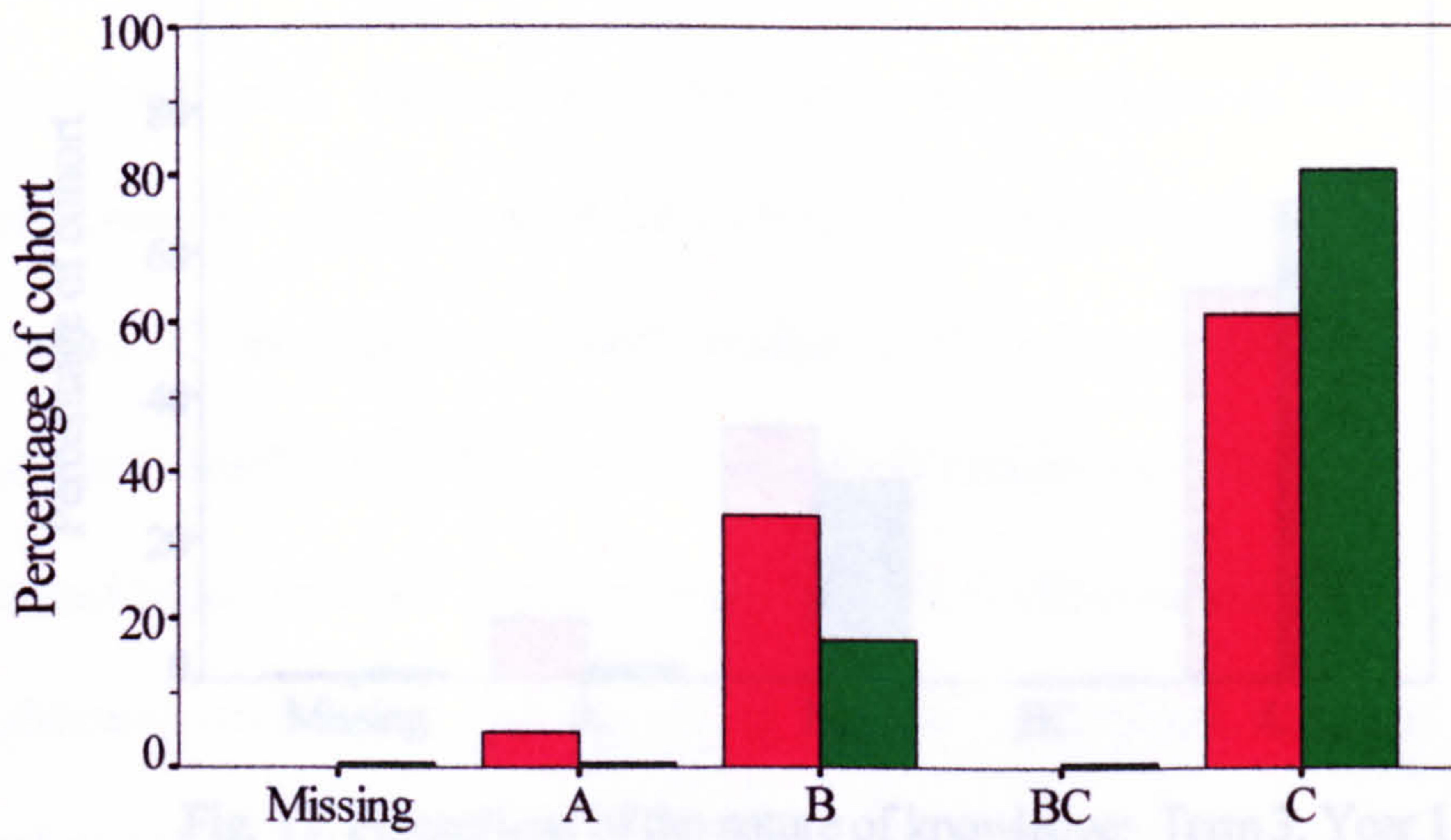


Fig. 9 Perceptions of the student's role: Term 3, Year 1

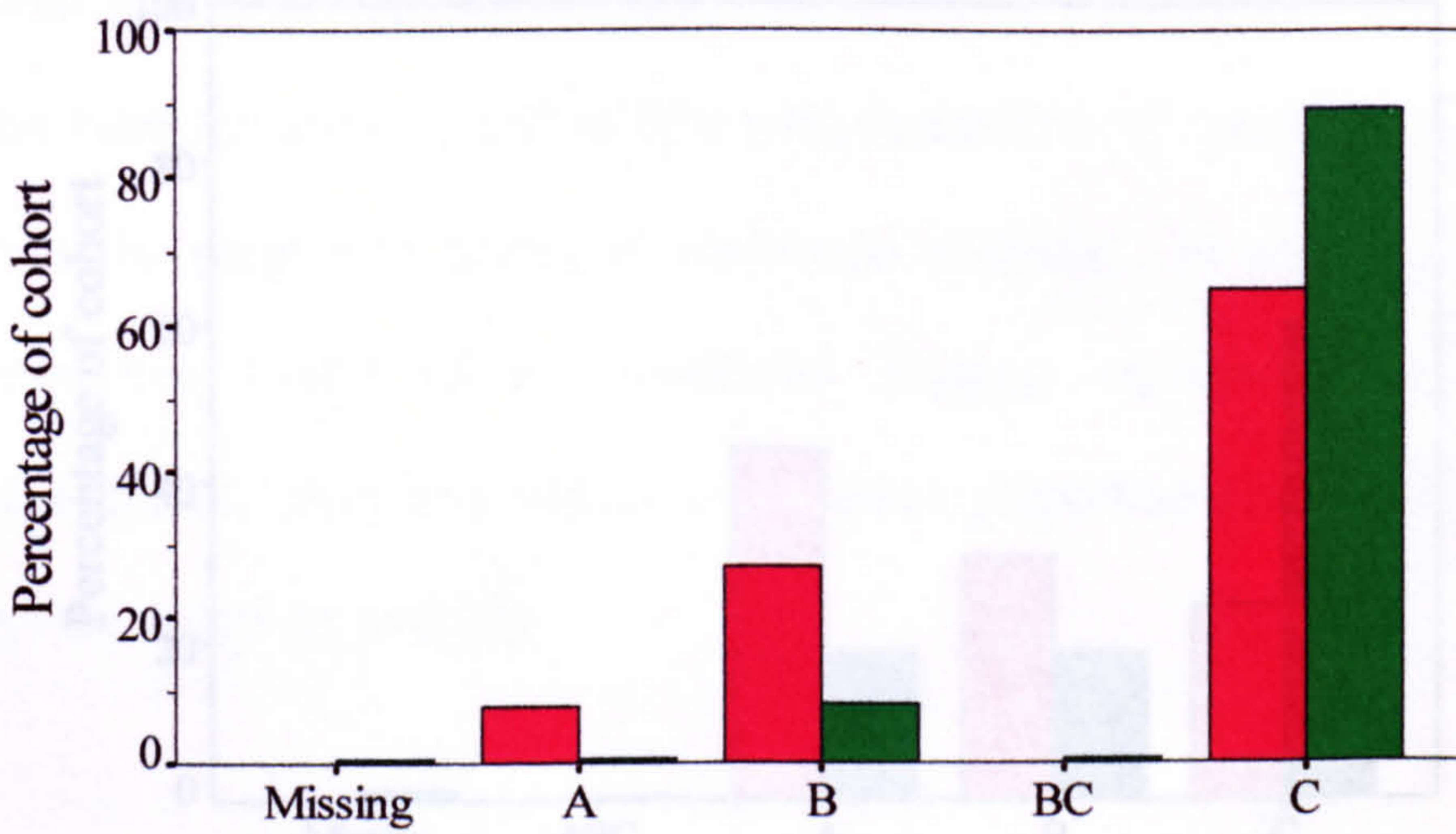


Fig. 10 Perceptions of the role of staff: Term 3, Year 1

- Students in the traditional course
- Students in the PBL course

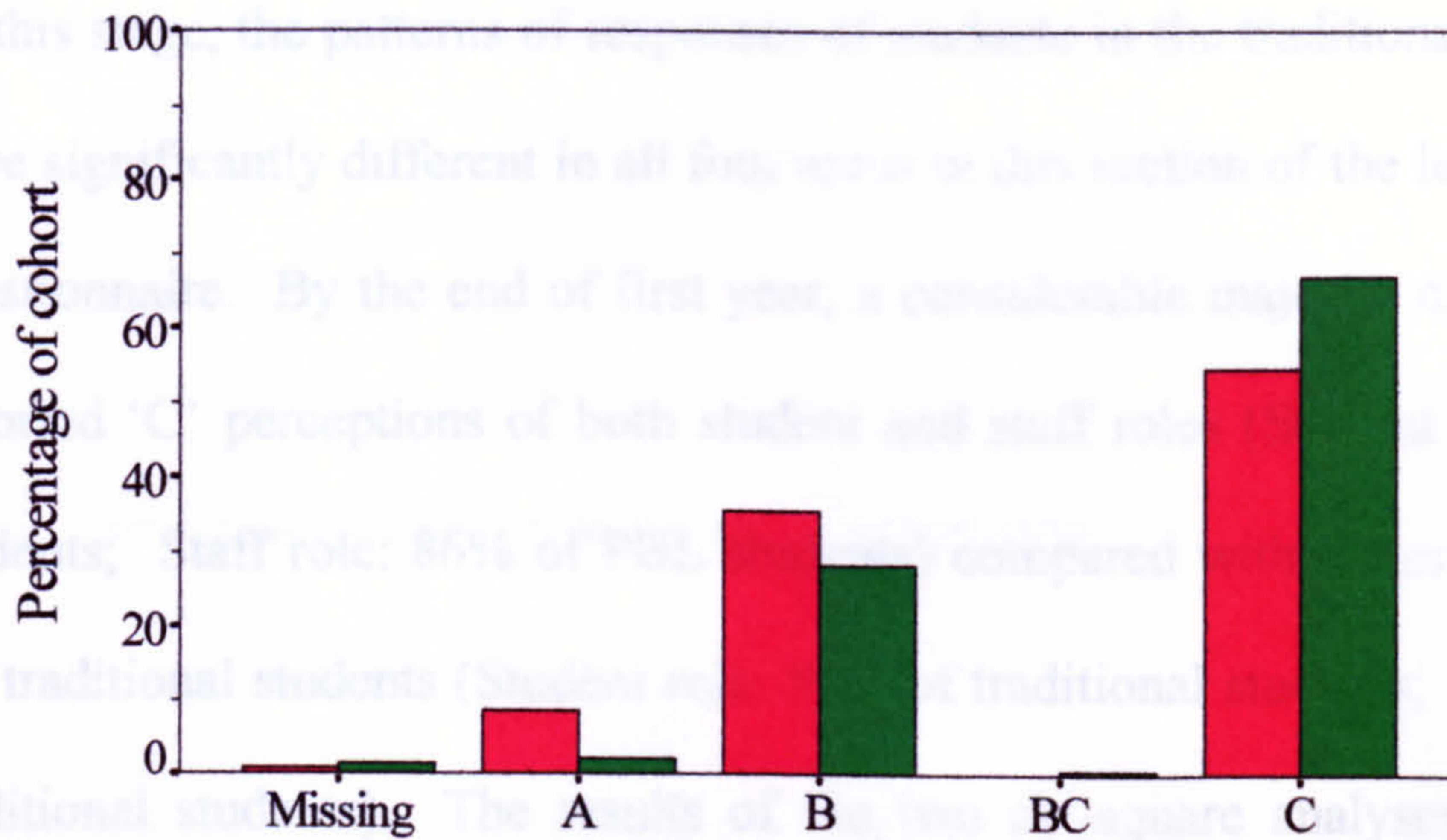


Fig. 11 Perceptions of the nature of knowledge: Term 3, Year 1

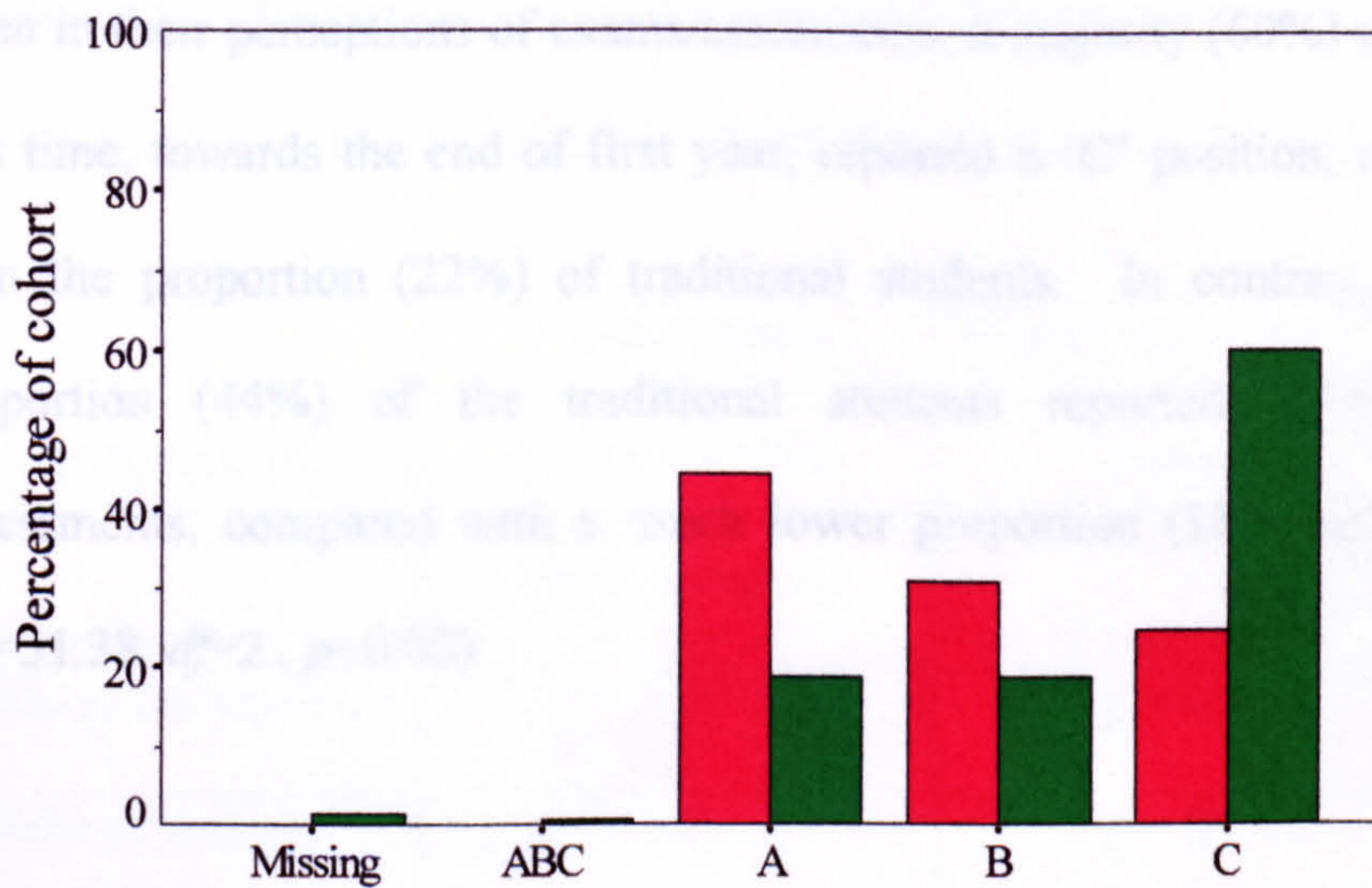


Fig. 12 Perceptions of task in exams/assessments: Term 3, Year 1

- Students in the traditional course
- Students in the PBL course

At this stage, the patterns of responses of students in the traditional and PBL courses were significantly different in all four areas in this section of the learning perceptions questionnaire. By the end of first year, a considerable majority of the PBL students reported 'C' perceptions of both student and staff roles (Student role: 81% of PBL students; Staff role: 86% of PBL students) compared with rather more than half of the traditional students (Student role: 59% of traditional students; Staff role: 64% of traditional students). The results of the two chi-square analyses were as follows: Student role: $\chi^2=13.62$, $df=1$, $p=0.00$; Staff role: $\chi^2=26.14$, $df=2$, $p=0.00$.

Even in their perceptions of exams/assessments, a majority (60%) of PBL students by this time, towards the end of first year, reported a 'C' position, significantly higher than the proportion (22%) of traditional students. In contrast, a relatively high proportion (44%) of the traditional students reported 'A'-type views about assessments, compared with a much lower proportion (18%) of the PBL students ($\chi^2=31.38$, $df=2$, $p=0.00$)

Also, for the first time, significant differences between the two cohorts became evident at the end of the year in their views about the nature of knowledge, the one area in which the students had shown greatest similarity at earlier stages ($\chi^2=7.80$, $df=2$, $p=0.02$). Here, more of the students in the PBL course reflected 'C'-type views (66% of PBL students, compared with 52% of the traditional students). Conversely,

more of the students in the traditional course gave 'A' and 'B' perspectives (42% of traditional students; 31% of PBL students), with an emphasis on the latter.

4.4.4 Summary of between-group comparisons

Table 6 summarises the differences which were found in responses to the four sentence stems between students in the traditional course and those in the PBL course during their first undergraduate year in medicine.

Table 6 Comparison of students in the traditional course and problem-based course: significance of differences in perceptions of learning

Perceptions of:	'Pre-university' (based on retrospective report)	Beginning of Year 1 (Term 1)	End of Year 1 (Term 3)
Role of the student	NS*	p = 0.00	p = 0.00
Role of lecturer/ member of staff	NS	p = 0.04	p = 0.00
Nature of knowledge	NS	NS	p = 0.02
Student's job in exam/assessments	NS	p = 0.01	p = 0.00

*NS = no significant differences in the perceptions of the two cohorts of students

Having been asked to look back to the period before coming to university and to think about what their views about teaching and learning were at that time, the students in both the traditional course and the problem-based learning course reported similar perceptions in each of four elements: the role of the student; the role of the lecturer or member of staff; the nature of knowledge; and the student's job in an examination and assessments. However, even as early as halfway through the first term of the academic session, differences between the two student cohorts were evident in three of the four elements: the roles of the students and of staff members and the student's task in the exam/assessment situation. By the end of their first year, the perceptions reported by the groups of students in the two different courses differed significantly in relation to all four elements. More specifically, in three of these elements, the roles of students and of staff members and the task of students in exams/assessments, the differences were highly significant at this stage of the course.

Table 7 provides information about the percentage of students in each course who endorsed 'C'-type views by the end of first year, as measured by their responses to the four sentence stems in the questionnaire on learning perceptions.

Table 7 Percentage of students in the traditional and problem-based courses who reported 'C' perspectives by the end of Year 1

Perceptions of:	Students enrolled in the traditional course (N=126)	Students enrolled in PBL course (N=134)
Role of the student	59%	81%
Role of lecturer/ member of staff	64%	86%
Nature of knowledge	52%	66%
Student's job in exams/assessments	22%	60%

From Table 7 it can be seen that, with the exception of the exam/assessment-related element, more than half of the students in each course reported 'C' perspectives by the end of first year in these important aspects of their undergraduate experience. The trends *within* each cohort will be discussed in Section 4.5. However, the above percentages also underline how much more marked this was amongst students in the problem-based learning course, especially in terms of how they saw their own role as

students and that of their lecturers and members of staff. The largest divergence between the students in the two courses emerged in relation to their views about exams and assessments, where fewer than a quarter of those enrolled in the traditional course saw the assessment situation as 'open-ended', allowing for open questions which would provide students with scope for showing evidence of their own thinking and to draw on what they had learned not only from staff but also by themselves by further reading or from other sources.

4.5 Within-groups comparisons of perceptions reported at the beginning and end of first year by i) students in the traditional course and ii) students in the problem-based learning course

In addition to contrasting the group responses of the two student cohorts at the pre-university stage and at the beginning and end of first year, it is also interesting to consider the traditional and PBL groups separately and to trace any trends in perceptions over time within each group of students in relation to each of the four elements: the role of student; the role of lecturers/staff members; the nature of knowledge; and the student's task in the exam/assessments. As with the between-group comparisons described in the previous Section, it should be borne in mind that in this Section also the comparisons are being drawn on the basis of the overall group pattern in each cohort of students at each point in time; it is not the case that these comparisons trace changes over time in the responses of *individual* students. It should be noted also that the within-group comparisons described below were not

analysed statistically, as the between-group comparisons were, but were based on inspection of the bar charts presented earlier (Figures 1 to 12) and descriptive statistics.

By the *end* of the first year, compared with their perceptions of their role as a student *before* coming to university, each of the two cohorts showed quite a considerable increase in the proportions of students reflecting a 'C' position (Figures 1, 5, and 9), with a very small percentage of students in both courses agreeing with an 'A' type perspective. A similar pattern can be seen in perceptions of the role of staff (see Figures 2, 6, and 10). Here again, in both cohorts of students, there was a marked shift over the year towards a 'C' position, leaving fewer at 'A' at the end of the year. These shifts by the groups as a whole were more pronounced when retrospective pre-university views were compared with those described in the middle of the first term. From first to third terms, however, the trends in each cohort were less consistent. In relation to views of the student's role, there was a slight shift backwards in the PBL group, mainly from 'C' to 'B', although the percentages of PBL students reporting a 'C' position remained high in both first and third terms (84% and 81%, respectively). For the traditional group, too, there was a slight movement, this time forwards, to 'C'. With reference to views of the role of staff, similar proportions of the PBL group endorsed a 'C' perspective on both occasions while, for the traditional group, there was a movement backwards between first and third terms, leaving fewer of them at 'C', more at 'B', and slightly more at 'A' by the end of the year.

Although views about the nature of knowledge (Figures 3, 7 and 11) also followed the trend of a move towards a 'C' perspective when retrospective reports were compared with first term ones, both cohorts moved backwards from 'C' to a small extent between first and third terms, the traditional group slightly more so than the PBL one.

The student's task in exams/assessments (Figures 4, 8 and 12) was that aspect of the learning experience which was associated with the smallest percentage of each group of students endorsing 'C'-type statements by the end of the academic year: 22% of the traditional group and 60% of the problem-based group. Comparing pre-university and first term perceptions, within both groups of students there was a move away from an 'A' position towards 'B' and 'C' positions, the shift from 'A' towards 'C' being clearer amongst the PBL students. Comparison of the bar charts for first and third terms shows that, in the case of the PBL students, there was a movement towards 'C' and away from 'A' and 'B' positions. For the traditional students, over the comparable time period, there was a slight movement backwards from 'C', a small increase in the percentage of the group positioned at 'B', and little change in the percentage at 'A'.

4.5.1 Summary of within-group comparisons

Generally, it appears that, at the middle of the first term in both traditional and PBL courses, more students reported 'C'-type views in contrast with the percentages who reported 'C' perspectives pre-university. However, there was a less consistent pattern of a forwards shift between first and third terms. For the group in the traditional course, there was some evidence of a slight shift backwards from a 'C' position from first term to third term in their perceptions of three of the four elements. The exception was the student's role, where there was evidence of a small movement forwards on the part of the group. The PBL group showed a slight shift backwards vis-à-vis the student's role and the nature of knowledge; it largely maintained the same position in relation to the role of staff; and it moved forwards vis-à-vis the student's task in exam/assessment situations.

In terms of the proportion of students reporting a 'C' position at the end of first year, it is very encouraging that so many of the students in the problem-based learning course seemed to be in this situation, especially in terms of their views about the roles of staff and student. Although the comparable percentages in every one of the four areas of the learning environments were considerably smaller in the case of the traditional group of students, it remains an encouraging finding that 'C' positions characterised at least half of this group in three of the four areas. Again, the fourth area which stood apart from the other three is the assessment/exam-related one and here the percentage of the traditional group who reported a 'C'-type approach was especially low.

CHAPTER 5

ANALYSES OF THE LEARNING PERCEPTIONS QUESTIONNAIRE II

CHANGE PATTERNS IN INDIVIDUALS' RESPONSES: SENTENCE STEMS

5.1 Introduction

This Chapter also describes analyses of the students' responses to the sentence stems in the questionnaire on learning perceptions. The four sentence stems concerned the student's role, the role of lecturers/members of staff, the nature of knowledge and the student's task in examination/assessment situations. However, in contrast to the data analyses presented in the previous Chapter, which focused on overall *group* patterns of response, those reported here refer to the extent to which the responses of *individual* students in the two different types of courses appeared to change in the course of the first undergraduate year of study in medicine.

The first sections of the Chapter describe the percentages of students in the traditional and problem-based courses who seemed to be in a 'C' position at the end of the first year and the extent to which this represented a change in views or a continuation of the position reported by the student at the beginning of the year. This is followed by a

more detailed account of the extent to which the views of the individual students – within each course – changed ‘forwards’, ‘backwards’ or showed no change between the two times of measurement in first year. The remaining sections of the Chapter compare the extent and the nature of the changes or absence of change in these views of the traditional and PBL students, using non-parametric statistical analysis where appropriate.

5.2 Extent of changes in individual responses to the four sentence stems by students in the traditional and PBL courses

Table 8 elaborates on the information provided in Table 7 (Chapter 4, Section 4.3). As in Table 7, it shows the percentages of students in the traditional and PBL courses who reported ‘C’-type views at the end of their first undergraduate year in medicine in relation to student and staff roles, the nature of knowledge, and what was expected of students in assessment situations. However, in Table 8 these percentages have been sub-divided to show the percentages of students in each course who apparently i) *began* first year at ‘C’ and *maintained* that position at the end of the year and ii) *changed* to ‘C’ from ‘A’ or ‘B’ during the academic year.

Table 8 Extent of reported change in individuals' perceptions in
a 'C' direction during Year 1

Perceptions of:	Students enrolled in traditional course (N=126)		Students enrolled in PBL course (N=134)	
	n	%*	n	%*
Role of the student:				
<i>No change from 'C'</i>	48	38	95	71
<i>Changed to 'C'</i>	26	21	13	10
Role of lecturer/ member of staff:				
<i>No change from 'C'</i>	72	57	110	82
<i>Changed to 'C'</i>	8	6	5	4
Nature of knowledge:				
<i>No change from 'C'</i>	52	41	76	57
<i>Changed to 'C'</i>	13	10	13	10
Student's job in exams/assessments:				
<i>No change from 'C'</i>	12	10	45	34
<i>Changed to 'C'</i>	16	13	35	26

* The percentages shown have been rounded to whole numbers

With the additional information incorporated in Table 8, it is now clear that, in three of the four elements of the students' learning environment, the majority of students who reported 'C' perspectives at the end of first year have not changed their position as the year progressed. On the contrary, most reported 'C' perspectives in the middle of the first term and maintained them until the third term. The percentage of students in each course who seemed to change in a 'C' direction represented relatively small proportions.

As before, the exam/assessment- related element is at odds with the other three, with the proportions of students reporting a change towards 'C' versus no change from 'C' being more equally balanced within each cohort. It is notable, also, that this is the aspect that shows the largest percentage of students moving 'forwards' to 'C' and that it is reported by the PBL students.

Tables 9 and 10 provide a much more detailed analysis of the nature and degree of change in the responses of students in the traditional and PBL courses respectively at the beginning and end first year. What follows below is a description of the general patterns of change or absence of change within each cohort separately, prior to an account of the results of the statistical analyses which compared the extent of individuals' changes in perceptions in the traditional and PBL courses.

5.2.1 Students in the traditional course: general patterns of change in individual's responses to the four sentence stems

Table 9 Medical Undergraduates, Year 1, Traditional Course (N=126): Changes in sentence stem responses between November 1995 (Term 1) and May 1996 (Term 3)

<i>Change</i>	<i>My job as a student is:</i>		<i>I think the lecturer's job is:</i>		<i>I think that knowledge is:</i>		<i>My job in my exam is:</i>	
	N	%	n	%	n	%	n	%
No change	73	58	82	65	74	59	57	45
A	0		2		4		31	
B	25		8		18		14	
C	48		72		52		12	
Change 'forwards'	26	21	10	8	16	13	29	23
A ⇒ B	0		2		3		13	
A ⇒ C	1		3		0		10	
B ⇒ C	25		5		13		6	
Change 'backwards'	22	18	31	25	28	22	35	28
B ⇒ A	2		1		3		8	
C ⇒ A	4		7		4		16	
C ⇒ B	16		23		21		11	
Multiple responses given	0	0	0	0	2	2	2	2
Missing values	5	4	3	2	6	5	3	2
Total	126	101*	126	100*	126	101*	126	100*

* Percentages in the columns have been rounded to whole numbers

From Table 9, it can be seen that the largest percentage of respondents in all four elements is to be found in the 'No change' category. This is especially true of perceptions related to the role of staff and considerably less marked in those related to 'my job in the exam'.

Further inspection of the 'No change' category in the exam/assessment-related element shows that, compared with the other three areas, it encompasses a quite different pattern of 'A', 'B' and 'C' responses from students. In the other three areas, most of the students (two-thirds or more) in the 'No change' category reported 'C'-type perceptions to begin with. However, in the context of exams/assessments, this situation is completely reversed, with fewer than a quarter (21%) of the students in a 'C' position. Indeed, more than a half (54%) were in an 'A' position at the beginning of the course and remained there at the end of the year.

In three of the four areas - the role of staff, the nature of knowledge, and the student's task in the exam/assessments - it is of some concern that a sizeable minority of students reported a change in a 'backwards' direction: 25%, 22% and 28% respectively. In the case of the first two elements, referring to staff and knowledge, most of the students (approximately three-quarters) in this situation reported a change 'backwards' from a 'C' to a 'B' position. Once again, the pattern of responses in the exam-related aspect is somewhat different. In contrast, here more than two-thirds (69%) of the students reported a change 'backwards' to an 'A'-type position by the end of the year, largely from an initial 'C' perspective at the beginning of the year. A

much smaller proportion, about one-third (31%), moved 'backwards' from 'C' to 'B'. Interestingly, the exam-related category, in contrast with the other three, also contains the largest percentage of students (23%) who reported changing 'forwards' during their first year, and many of these finished at 'C' by the end of the year.

5.2.2 Students in the PBL course: general patterns of change in individuals' responses to the four sentence stems

Table 10 gives a similar, detailed analysis of the patterns of change or absence of change in the individual responses of students in the problem-based learning course.

Table 10 Medical Undergraduates, Year 1, PBL Course (N=134): Changes in sentence stem responses between November 1996 (Term 1) and May 1997 (Term 3)

Change	My job as a student is:		I think the job of staff is:		I think that knowledge is:		My job in exams/ assessments is:	
	n	%	n	%	n	%	N	%
No change	102	76	113	84	97	72	70	52
	A 0		1 1		0 0		15 15	
	B 7		2 2		21 21		10 10	
	C 95		110 110		76 76		45 45	
Change 'forwards'	13	10	6	4	14	10	39	29
	A ⇒ B 0		1 1		1 1		4 4	
	A ⇒ C 0		2 2		0 0		16 16	
	B ⇒ C 13		3 3		13 13		19 19	
Change 'backwards'	17	13	7	5	19	14	18	13
	B ⇒ A 0		0 0		2 2		5 5	
	C ⇒ A 1		0 0		1 1		4 4	
	C ⇒ B 16		7 7		16 16		9 9	
Multiple responses given	1	1	1	1	1	1	2	2
Missing values	1	1	7	5	3	2	5	4
Total	134	101*	134	99*	134	99*	134	100*

* Percentages in the columns have been rounded to whole numbers

As was the case with the students in the traditional course, most of the students in the PBL course reported 'No change' during their first year in their perceptions of the four aspects of the learning environment. Mirroring the results from the other cohort, this was most obvious in their views about the role of lecturers/members of staff, less so in exam/assessment-related views. For each of the four elements, most of the PBL students who reported 'No change' were in a 'C' position near the beginning of first year and stayed there until the end of the year.

However, in contrast with the results from the students in the traditional course, the percentages of students in the PBL course who reported 'backward' changes in the course of their first year were comparatively small, ranging from 5%, in relation to the role of staff, to 14%, in relation to knowledge. Of those students who seemed to have moved back, almost all moved from 'C' to 'B' in respect of their views about student and staff roles and knowledge but a half (n=9) moved back to 'A' from either 'C' or 'B' in their views about exams/assessments. In the exam/assessment-related category, though, a sizeable minority (29%) reported a 'forward' movement in their views, almost all (35 of 39 students) moving forwards to a 'C' position.

5.3 Summary of individual changes in response to the four sentence stems by students in the traditional and problem-based courses

At the end of their first year in medicine, more than a half of the students in each cohort reported holding 'C'-type views in respect of the student's role, the role of lecturers/members of staff, and the nature of knowledge. In the majority of cases, this did not reflect a *change* to 'C' during the academic year but a continuation of the position originally reported near the beginning of the year. Only a relatively small percentage of students in each course seemed to change towards 'C' as they progressed through the academic session. In contrast, the views endorsed about exams/assessments reflected similar percentages of students in the two courses who maintained a 'C' position *and* who changed in that direction.

Only a small percentage of the problem-based learning students reported a 'backwards' change, generally from 'C' to 'B' positions, while comparatively more of the students in the traditional course seemed to change in this direction. In exam/assessment-related perceptions, two observations can be made. Firstly, there was evidence of a move 'backwards' towards A, more so for the traditional students. Two-thirds of them moved back to an 'A' position, compared with half of the PBL students. Secondly, a surprisingly large minority in each course reported a change 'forwards' in this aspect of their learning environment. In the case of the PBL students, this was mostly towards a 'C' position. Just over a half of the traditional students who made a 'forwards' shift did so to 'C'.

**5.4 Extent of changes in individual responses to the four sentence stems:
comparisons of students in the traditional and PBL courses**

Where appropriate, statistical analyses, based on the data contained in Tables 9 and 10, were carried out to determine whether students in the traditional and problem-based learning courses differed significantly in their patterns of change in perceptions and in the nature of change where it had occurred. Where the data met the requirements of the test, the chi-square test was used. The tables to which the chi-square test was applied are shown in Appendix 4 (Tables xiii-xvi). Figures 13 to 16 show the degree of change/absence of change in the perceptions of the students in the two different courses from the beginning of first year to the end of first year. The key to the categories shown on the X-axis of each bar chart is as follows:

AA	No change:	'A' position at beginning and end of Year 1
BB	No change:	'B' position at beginning and end of Year 1
CC	No change:	'C' position at beginning and end of Year 1
AB	Change 'forwards':	from 'A' at beginning to 'B' at the end of Year 1
AC	Change 'forwards':	from 'A' at beginning to 'C' at the end of Year 1
BC	Change 'forwards':	from 'B' at beginning to 'C' at the end of Year 1
BA	Change 'backwards':	from 'B' at beginning to 'A' at the end of Year 1
CA	Change 'backwards':	from 'C' at beginning to 'A' at the end of Year 1
CB	Change 'backwards':	from 'C' at beginning to 'B' at the end of Year 1

In three of the chi-square analyses, those involving the student and staff roles and the nature of knowledge, the three sub-categories which characterised 'Change forwards' (AB, AC, and BC) were combined into a single category for the purposes of the analyses. Likewise, the three which represented 'Change backwards' (BA, CA, and CB) were combined also to form a single category for the statistical analyses. In the chi-square analyses of the responses related to exams/assessments, it was not necessary to combine cells in this way and so the chi-square test was carried out using the separate sub-categories in both 'Change backwards' and 'Change forwards'.

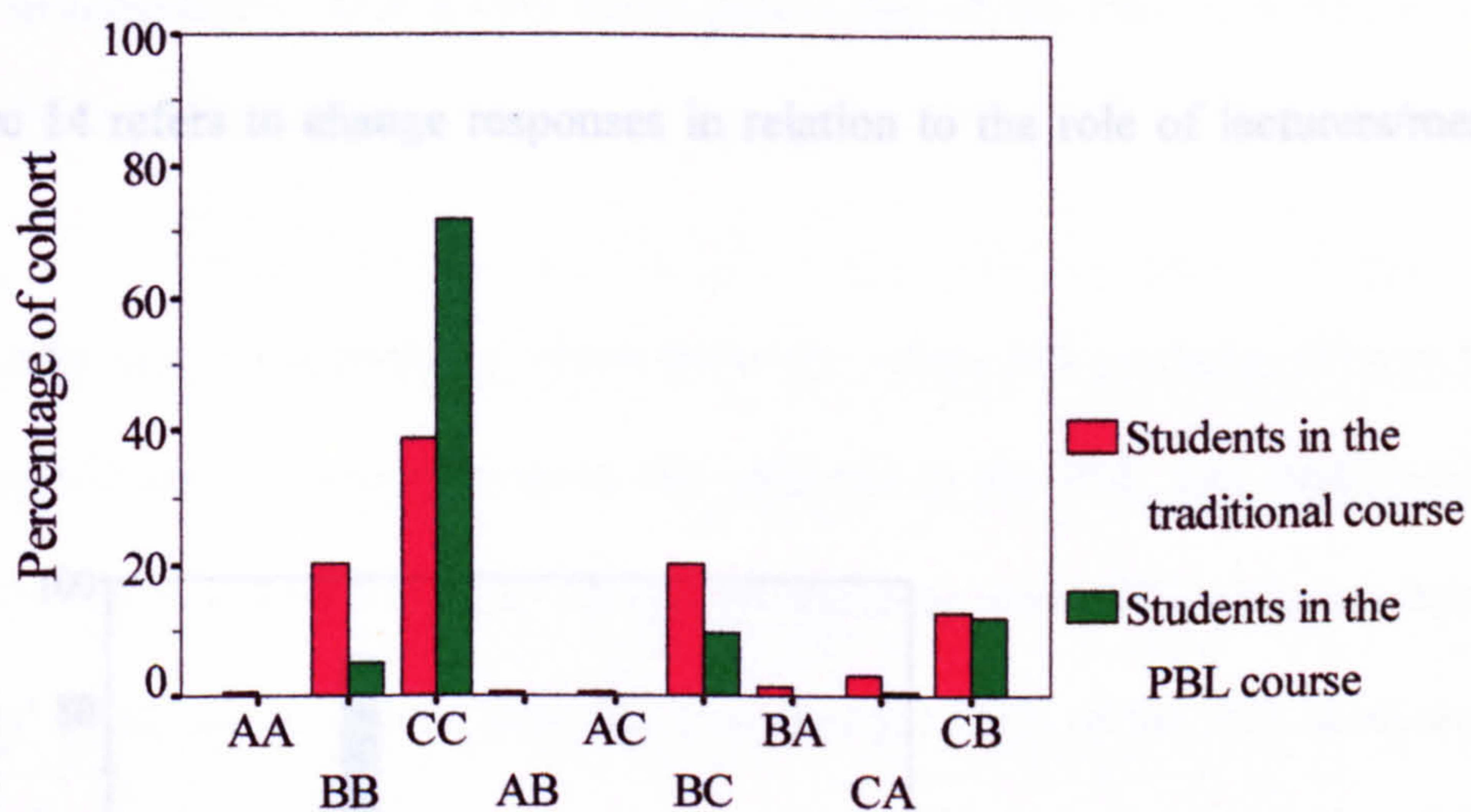


Fig.13 Extent of change in students' perceptions of student role

In Figure 13, the distribution of change responses about perceptions of the student's role shows a highly significant difference between the two cohorts of students ($\chi^2=30.6$, $df=3$, $p=0.00$). The most striking difference is in the category, 'CC' (No change): almost three-quarters (72%) of the students in the problem-based course

were in this position at the beginning and end of first year, in contrast with only 40% of those in the traditional course. Also, about one-fifth (21%) of the students in the traditional group started and finished the year in a 'B' position, compared with only a very small proportion (5%) of the students in the PBL course. On a positive note, twice as many students (21%) in the traditional course as in the PBL course (10%) reported a change 'forwards', and this was towards a 'C'-type position but clearly it has to be remembered that, since a large percentage of the PBL students maintained 'C' and 'B' perceptions (72% and 5% respectively) throughout the year, there were fewer of this cohort available to change 'forwards'.

Figure 14 refers to change responses in relation to the role of lecturers/members of staff.

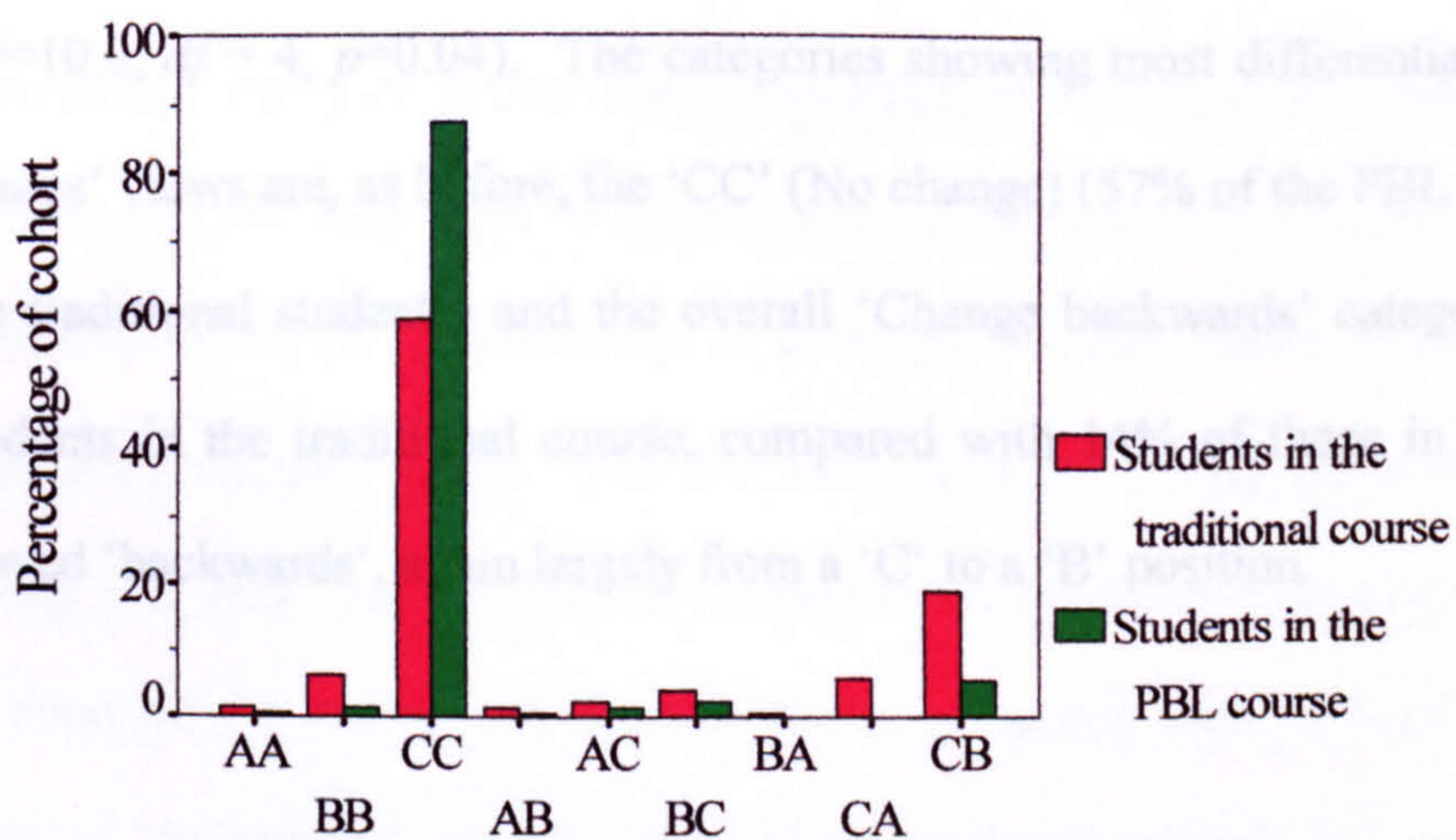


Fig.14 Extent of change in students' perceptions of role of staff

The results of this chi-square test were unlikely to be valid, since 30% of the cells had an expected frequency of less than 5. The rule of thumb is that there should be no more than 20% of the cells in the contingency table with an expected frequency of less than 5 (Siegel and Castellan, 1988). However, inspection of the bar chart in Figure 14 shows that the largest difference between the two groups of students is to be found in the same category as for the student role. A considerable majority (87%) of the PBL students held 'C'-type perceptions throughout the year, compared with 58% of the traditional students. In addition, a quarter of the traditional students appear to have changed 'backwards', mainly from 'C' to 'B', in their views about the role of staff, in comparison with a very small percentage of the PBL students, all of whom moved from 'C' to 'B'.

With reference to the students' views about the nature of knowledge (Figure 15), there is a significant difference between the students in the PBL and traditional courses ($\chi^2=10.0$, $df = 4$, $p=0.04$). The categories showing most differentiation between the groups' views are, as before, the 'CC' (No change) (57% of the PBL students; 41% of the traditional students) and the overall 'Change backwards' category. 22% of the students in the traditional course, compared with 14% of those in the PBL course, moved 'backwards', again largely from a 'C' to a 'B' position.

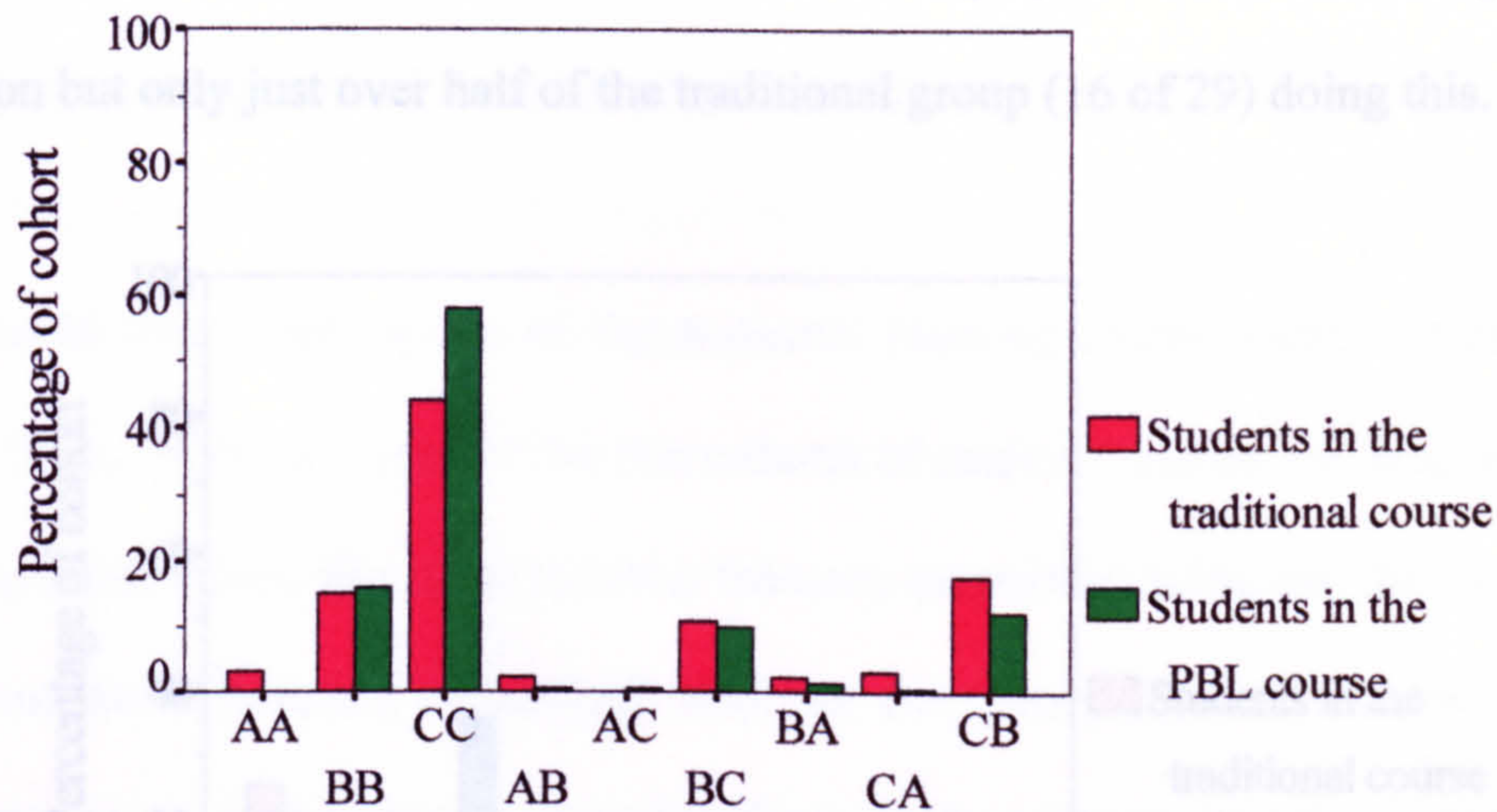


Fig.15 Extent of change in perceptions of nature of knowledge

Figure 16 shows the nature of any change in perceptions of what was expected of the student in his/her exams/assessments. The difference in response patterns of the students in the two courses is highly significant ($\chi^2=46.2$, $df=8$, $p=0.00$). Within the 'No change' category of response, approximately a third of the students (35%) in the PBL course but only 10% of the students in the traditional course remained at 'C' throughout the year. Conversely, in terms of 'A'-type views, twice as many of the traditional students (26%) than the PBL students (12%) maintained these views during first year. As was the case in relation to the three other elements, again twice as many of the traditional students (29%, compared with 14% of the PBL group) changed 'backwards', mostly (24 of 35 respondents) towards 'A' whereas only a half of the PBL students (9 of 18 respondents) moved back to 'A'. Similar overall proportions of the two groups of students (23% of traditional students; 29% of PBL

students) changed forwards but differences are apparent in the nature of the shifts, with almost all of the PBL students in this category (35 of 39) moving to a 'C' position but only just over half of the traditional group (16 of 29) doing this.

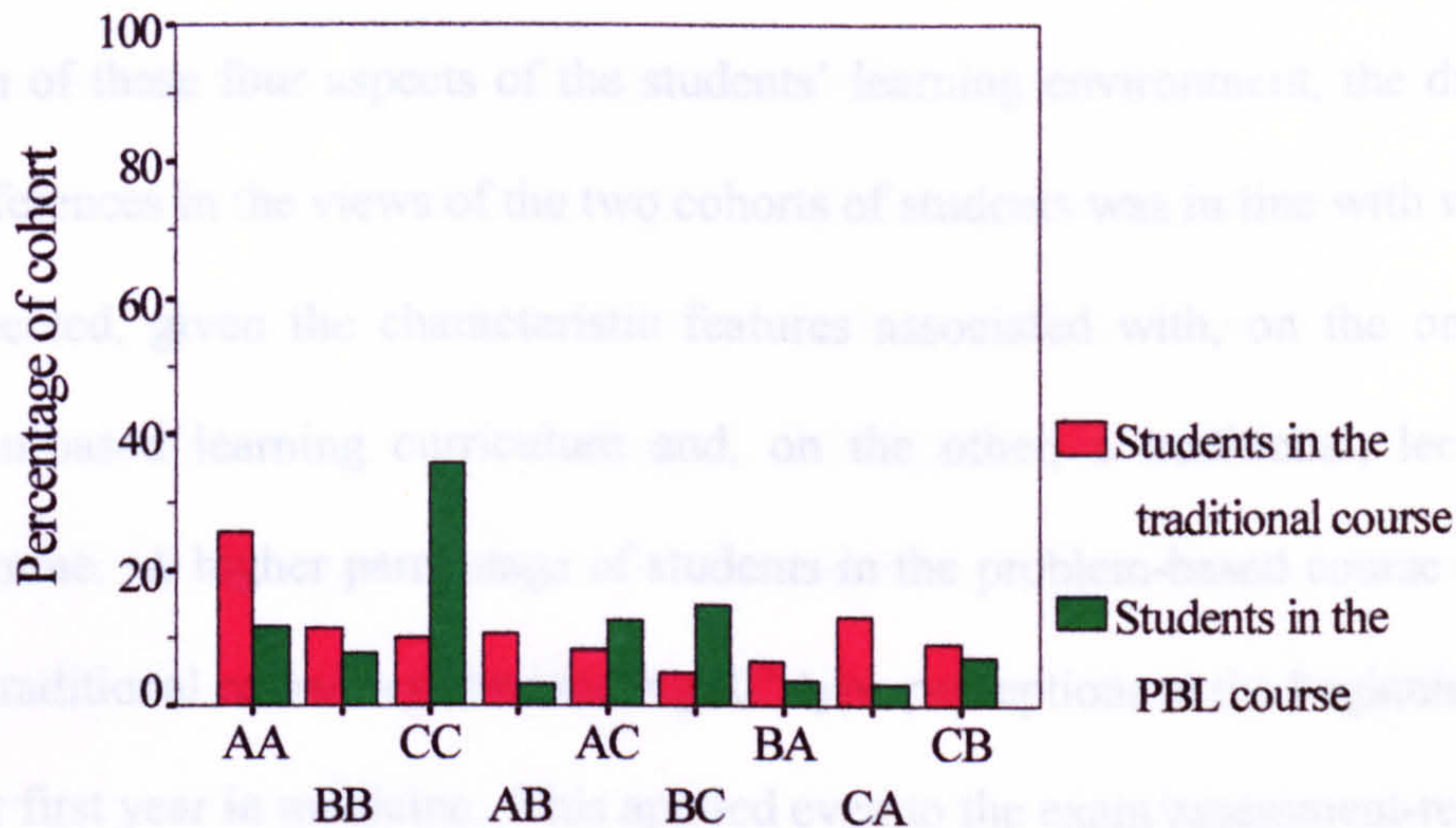


Fig.16 Extent of change in perceptions of exams/assessments.

5.4.1 Summary of comparisons of students in the traditional and PBL courses:

changes in individual responses to the four sentence stems

In general, relatively more of the students in the traditional group, compared with those in the PBL group, reported changes in their perceptions which could be interpreted as representing a "backwards" movement during first year. This change was found in the extent of changes in their perceptions of the general role of the undergraduate student and, more specifically, of what was expected of them in exam/assessment settings. A significant difference also existed in their views of 'knowledge'. It was not possible to analyse by means of the chi-square test the data which referred to perceptions of the role of lecturers/members of staff. However,

comparison of the distributions of the change responses of the two groups of students shown in the appropriate bar chart showed differences similar to those found for changes in perceptions of the student role and knowledge.

In each of these four aspects of the students' learning environment, the direction of the differences in the views of the two cohorts of students was in line with what might be expected, given the characteristic features associated with, on the one hand, a problem-based learning curriculum and, on the other, a traditional, lecture-based programme. A higher percentage of students in the problem-based course than those in the traditional course reported having 'C'-type perceptions at the beginning and end of their first year in medicine. This applied even to the exam/assessment-related area, which has tended to reflect slightly different patterns of response in both cohorts in most of the analyses. In this area, in addition, the relatively higher proportion of traditional students who reported an 'A' position at the beginning of the year and held it until the end of the year was marked.

In general, relatively more of the students in the traditional group, compared with those in the PBL group, reported changes in their perceptions which could be interpreted as representing a 'backward' movement during first year. This change 'backwards' on the part of the traditional students was mostly towards 'B' positions in terms of the role of lecturers/members of staff and 'knowledge' but, in the case of exams/assessments, this move was largely towards 'A'.

Finally, there was evidence of what could be described as change 'forwards' in both cohorts. Firstly, relatively more of the students in the traditional course reported such a change in perception of the role of student, although it has to be noted that, since a considerable percentage of the students in the problem-based learning course started and finished first year with a 'C'-type perspective in this respect, clearly there were fewer in the PBL course able to report such a move forwards. Secondly, it was encouraging that a fair proportion of students in both courses reported a change 'forwards' in the exam/assessment area, although there were differences between students in the two courses in terms of the extent of that change, since movement towards 'C' accounted for almost all of the PBL students but only about a half of the traditional students in this response category.

6.1 Introduction

The Section consisting of the four sentence stems in the learning perceptions questionnaire, which formed the focus of the analyses of data in Chapters 4 and 5, asked students to respond to each stem by selecting the most appropriate statement from three possibilities (see Appendix 1). The subsequent Section in the learning perceptions questionnaire (Section C in the form administered in Term 1; Section B in the form administered in Term 3) consisted of a series of 15 statements. In each one, students were asked to indicate the extent of their agreement/disagreement on a five-point scale, where 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, and 5 = *Strongly Agree*.

CHAPTER 6

ANALYSES OF THE LEARNING PERCEPTIONS

QUESTIONNAIRE III

CHANGE PATTERNS IN INDIVIDUALS' RESPONSES: LIKERT-TYPE STATEMENTS

6.1 Introduction

The Section consisting of the four sentence stems in the learning perceptions questionnaire, which formed the focus of the analyses of data in Chapters 4 and 5, asked students to respond to each stem by selecting the most appropriate statement from three possibilities (see Appendix 1). The subsequent Section in the learning perceptions questionnaire (Section C in the form administered in Term 1; Section B in the form administered in Term 3) consisted of a series of 15 statements. In each one, students were asked to indicate the extent of their agreement/disagreement on a five-point scale, where 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree*, and 5 = *Strongly Agree*.

As described in Chapter 3, Section 3.3.1, the list of 15 statements consisted of three groupings of five statements, each grouping devised to represent the three different student perspectives on teaching and learning - 'A', 'B', and 'C' - derived from Perry's theoretical framework. Generally, these statements encompassed the same areas that were contained in the sentence stems - that is, views about the role of the student, the role of lecturers/members of staff, the nature of knowledge, and the student's job in his/her exams/assessments - although, in some instances, a single statement referred to a combination of two or more of the areas.

The results described in this Chapter are drawn from comparisons of the responses to the 15 statements given by students in the traditional and problem-based courses, specifically in terms of the patterns of change or absence of change exhibited in students' individual responses given in the middle of the first term of first year and those reported towards the end of the third term in the same academic year. This is the same time period used for the earlier analyses of responses to the sentence stems (Chapter 5, Section 5.4)

The results of the comparisons of the year-long responses of the two groups of students are described below according to the three groupings of the 15 statements, that is, 'A' statements, 'B' statements, and 'C' statements. If it is proposed that the problem-based learning curriculum is likely to be more successful than the traditional lecture-based one in encouraging undergraduate students to take a more independent and analytical approach to learning, then it would be reasonable to expect different

patterns of response from the two cohorts of students to statements in the different groupings. For example, a greater proportion of students in the problem-based course might be expected to agree more with 'C' statements and to disagree more with 'A' statements, certainly by the end of first year, than would be expected for students in the traditional course.

Where appropriate, statistical analyses of the change in responses to each of the 15 statements were carried out, using the chi-square test to determine whether the students in the two different types of curricula demonstrated significantly different response patterns during first year. In each chi-square analysis, six categories were used to classify the students' pattern of responses during the year. These were as follows:

- | | |
|-------------------------------|---|
| 'Agree': | Student agreed with statement at both beginning and end of Year 1 |
| 'Disagree': | Student disagreed with statement at both beginning and end of Year 1 |
| 'Neutral': | Student endorsed 'Neutral' response to statement at both beginning and end of Year 1 |
| Changed to 'Agree': | Student changed from 'Disagree' or 'Neutral' at the beginning of Year 1 to 'Agree' at the end of Year 1 |
| Changed to 'Disagree': | Student changed from 'Agree' or 'Neutral' at the beginning of Year 1 to 'Disagree' at the end of Year 1 |

Changed to 'Neutral': Student changed from 'Disagree' or 'Agree' at the beginning of Year 1 to 'Neutral' at the end of Year 1

The data for each statement on which the chi-square analyses were carried out are displayed in Appendix 4 (Tables xvii-xxxi).

The bar charts (Figures 17 to 31) presented in the following Sections provide for each statement a more detailed illustration of all possible change categories of response for individual students in the two courses during first year. In the bar charts, the categories of 'Disagree', 'Neutral' and 'Agree' all represent 'no change' in the appropriate response during first year. In the remaining six categories - 'Disagree-Agree', 'Neutral-Agree', 'Agree-Disagree', 'Neutral-Disagree', 'Disagree-Neutral', and 'Agree-Neutral' - the first of the pair is the response given at the beginning of first year, the second is the one given at the end of first year.

6.2 Changes in response to 'A' statements during first year: comparisons of students in the traditional and problem-based courses

Likert-type statements 1, 4, 7, 10 and 13 in the learning perceptions questionnaire (see Appendix 1) were devised in a previous study (Harvey, 1994) such that agreement with these statements was interpreted as indicating an 'A'-type approach to learning and teaching. Figures 17 to 21 show the distributions of change responses to these 'A' statements for students in the traditional and problem-based courses.

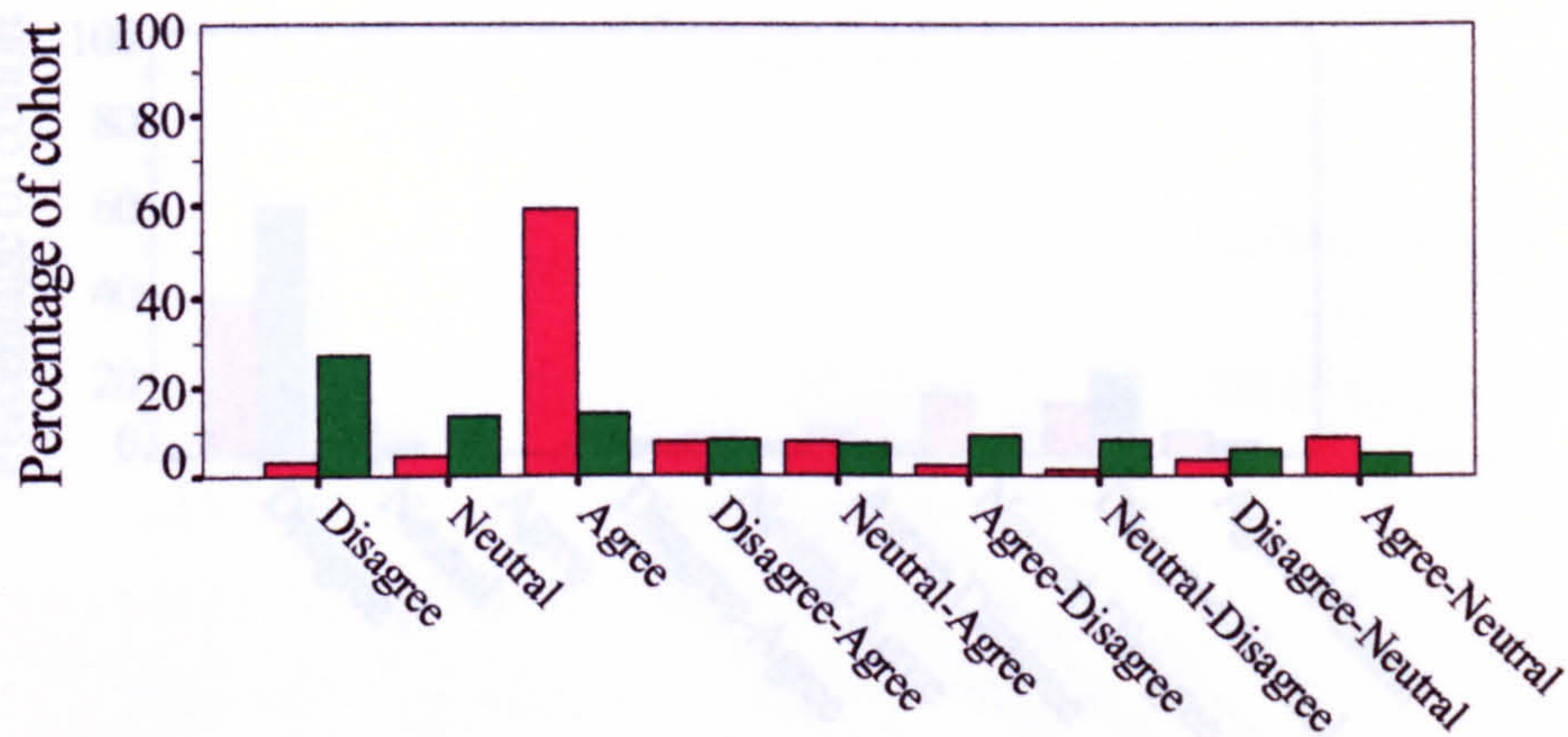


Fig. 17 Changes in individuals' responses during first year
 'I think it is the responsibility of the lecturer/staff to give me all the information I need to pass the exam/to pass.'

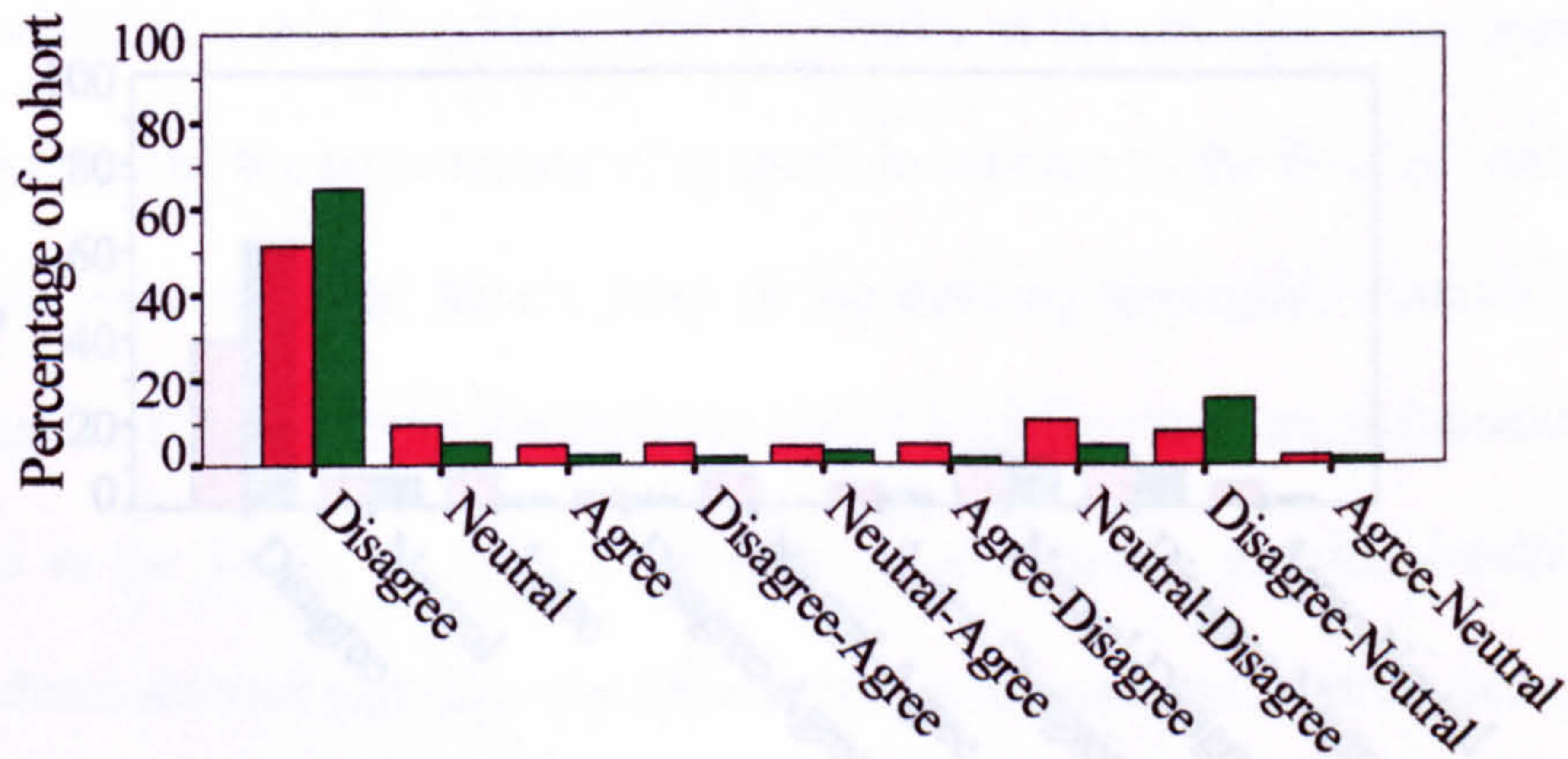


Fig. 18 Changes in responses during first year
 'There isn't any point in a course including things which will not be in the exam/assessed'

- Students in the traditional course
- Students in the PBL course

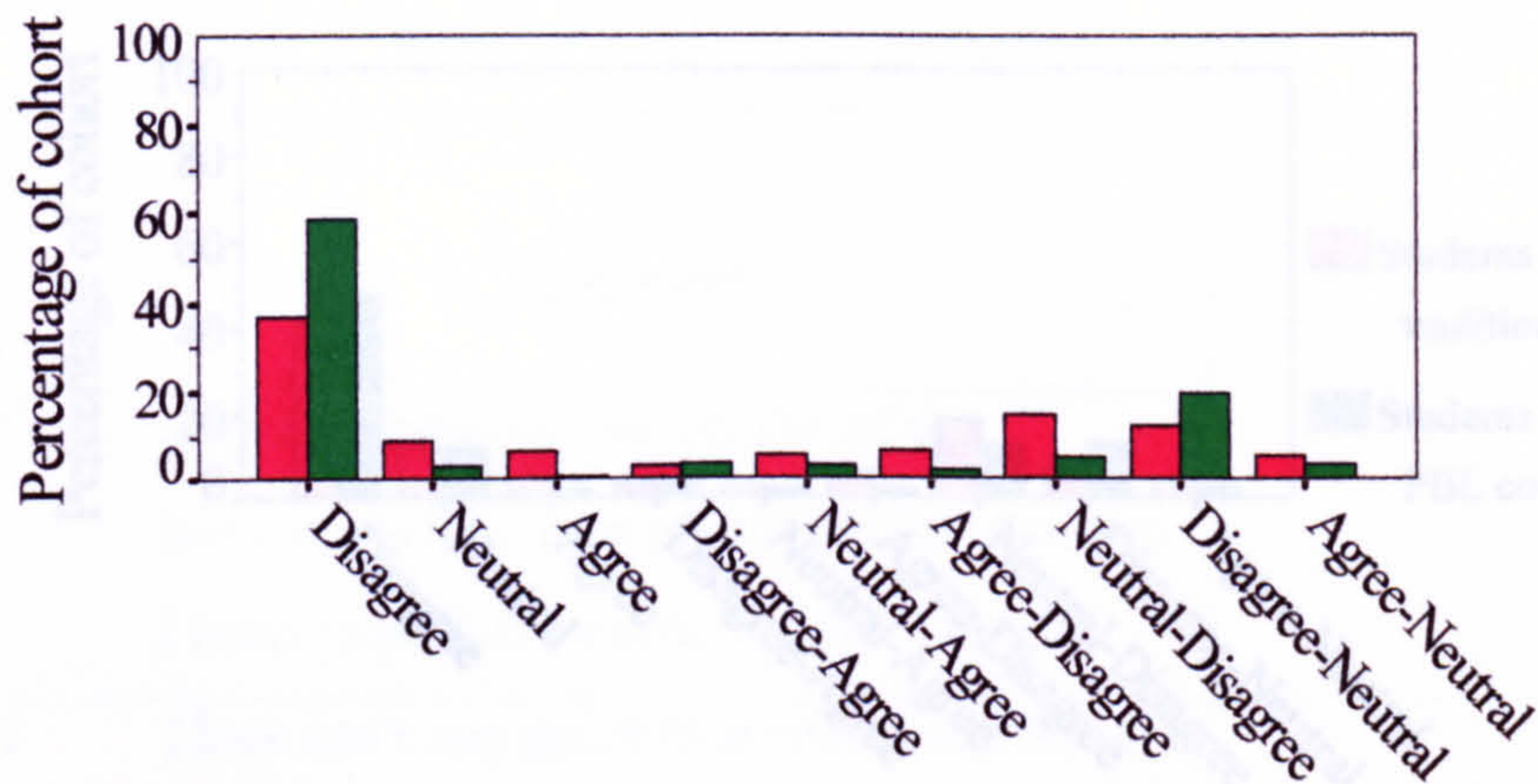


Fig. 19 Changes in responses during first year

'It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer'

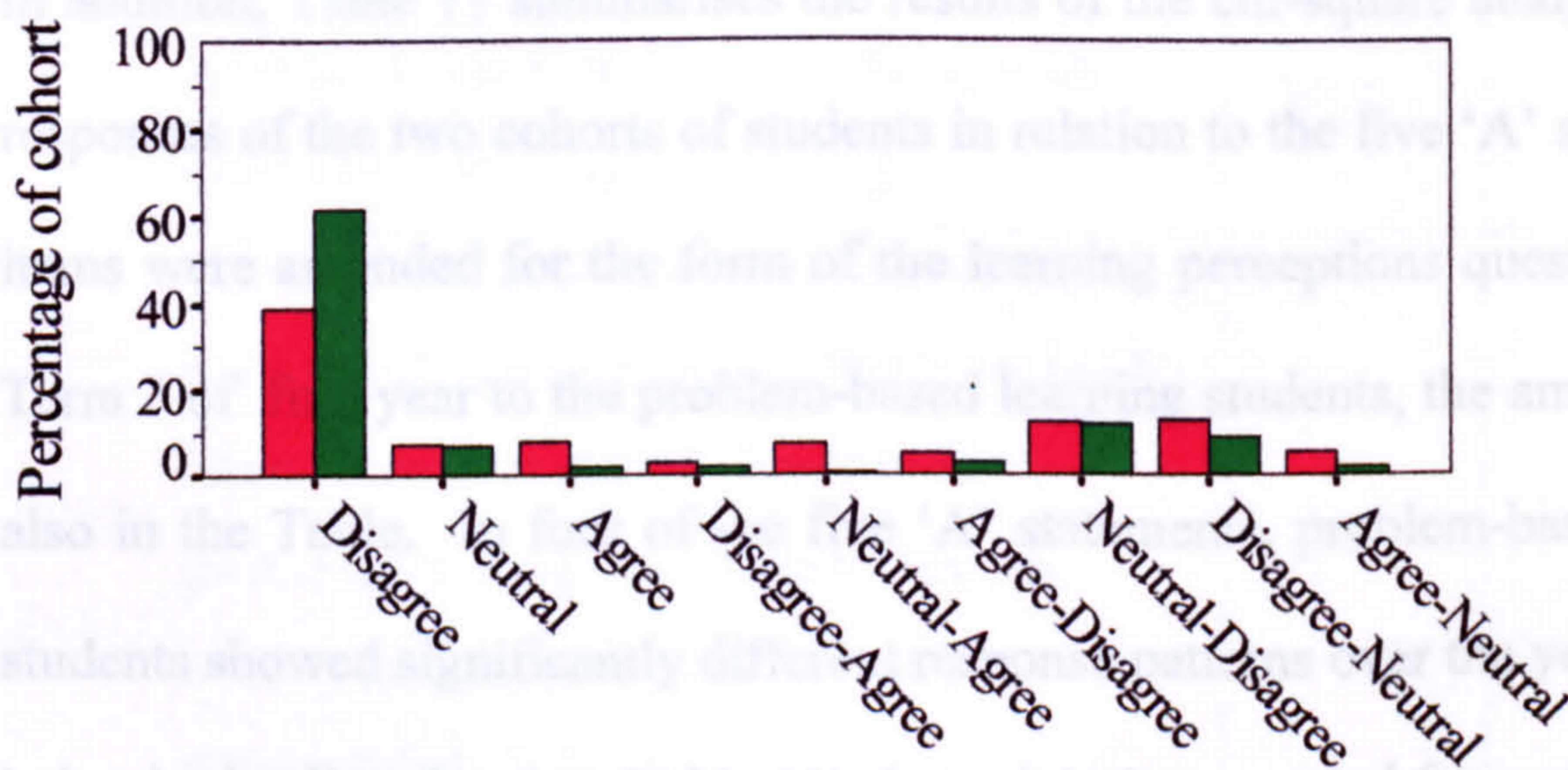


Fig. 20 Changes in responses during first year

'A good thing about learning medical sciences is the fact that everything is so clear-cut; either right or wrong.'

- Students in the traditional course
- Students in the PBL course

Table 11 'A' Statements: Summary of chi-square analyses of change responses of traditional and problem-based students during first year

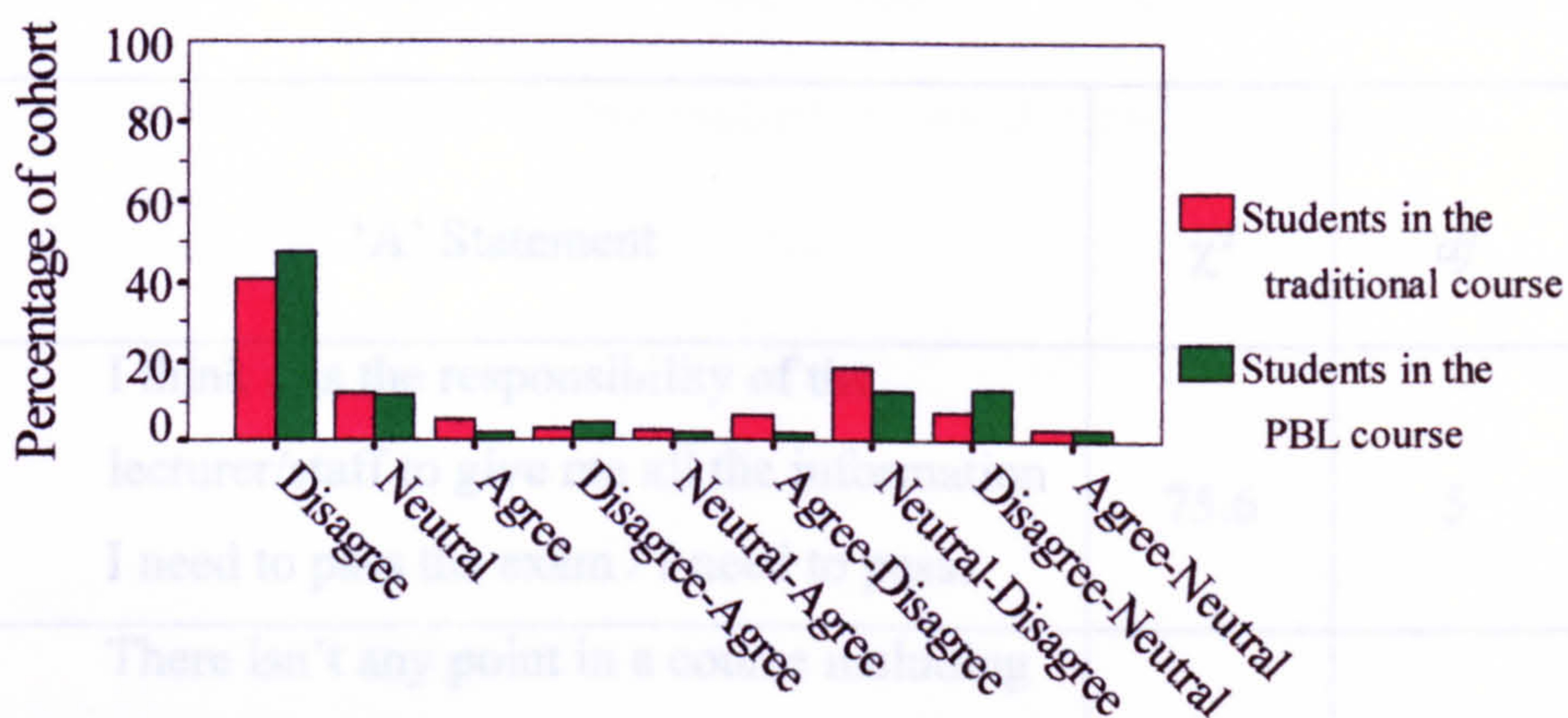


Fig. 21 Changes in responses during first year

'The only fair problem exercises (in a test) are the ones [those] which are exactly like those we have already ..'

In addition, Table 11 summarises the results of the chi-square analyses of the change responses of the two cohorts of students in relation to the five 'A' statements. Where items were amended for the form of the learning perceptions questionnaire issued in Term 3 of first year to the problem-based learning students, the amendment is shown also in the Table. In four of the five 'A' statements, problem-based and traditional students showed significantly different response patterns over the year, the differences being in the direction (see Table 12) that might be expected from students working in the different contexts provided by the two curricula.

Table 11 'A' Statements: Summary of chi-square analyses of change responses of traditional and problem-based students during first year

	χ^2	<i>df</i>	<i>p</i>
1. I think it is the responsibility of the lecturer/staff to give me all the information I need to pass the exam / I need to pass.	75.6	5	0.00
4. There isn't any point in a course including things which will not be in the exam / will not be assessed.	12.8	5	0.03
7. It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer.	25.5	5	0.00
10. A good thing about learning medical sciences is the fact that everything is so clear-cut; either right or wrong.	18.8	5	0.00
13. The only fair problem exercises are the ones which are exactly like those we have already done in class / The only fair problems in a test are those which are exactly like those we have already encountered.	7.8	5	0.17

The chi-square value which resulted from the chi-square test was based on the overall distribution of responses across the six response categories utilised in the analyses.

However, to assist in interpreting the analyses, it is helpful to extract from Tables xvii to xxi in Appendix 4 the response category or categories which showed the greatest differentiation between the two student cohorts. Table 12 summarises these for the 'A' statements on which the two student groups differed significantly.

Table 12 'A' Statements: Category of response showing largest differentiation between traditional and PBL students during first year

'A' Statement	Traditional		PBL		Response Category
	Students		Students		
	(N=126)		(N=134)		
	n	%	n	%	
1. I think it is the responsibility of the lecturer/staff to give me all the information I need to pass the exam / I need to pass.	74	59	19	14	'Agree': No change
4. There isn't any point in a course including things which will not be in the exam / will not be assessed.	65	52	85	65	'Disagree': No change
7. It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer.	46	37	78	59	'Disagree': No change
10. A good thing about learning medical sciences is the fact that everything is so clear-cut; either right or wrong.	48	39	82	62	'Disagree': No change

The responses to these 'A' statements were those that might be anticipated from students in the different learning environments represented by the traditional and problem-based courses. A significantly higher percentage of students in the PBL course disagreed with statements 4, 7, and 10, which concerned perceptions about the nature of knowledge and about the relationship between course content and assessment. Conversely, a significantly higher percentage of students in the traditional course agreed with statement 1, which focused on the role of staff in relation to assessment and the student's success in the course. What is also interesting is that, in these four instances, the disagreement and agreement were maintained by the students during the year, that is, no change in these responses occurred from the beginning to the end of first year.

Only one of the five 'A' statements showed no significant differences in the responses of the students in the different courses: *'The only fair problem exercises are the ones which are exactly like those we have already done in class/The only fair problems in a test are those which are exactly like those we have already encountered.'* By the end of their first year, the largest percentage of students in both cohorts disagreed (66% of traditional students; 63% of PBL students) and a large minority in each cohort (23% of traditional students; 28% of PBL students) held 'Neutral' views.

6.3 Changes in response to 'C' statements during first year: comparisons of students in the traditional and problem-based courses

It might be expected that the response pattern for the 'A' statements would be reversed when the results for the 'C' statements were examined and, to a large extent, this was the trend shown in the responses to the 'C' statements by the students in the traditional and PBL courses. Figures 22 to 26 illustrate the change responses of the two groups of students to each of the five 'C' statements (statements 3, 6, 9, 12, and 15).

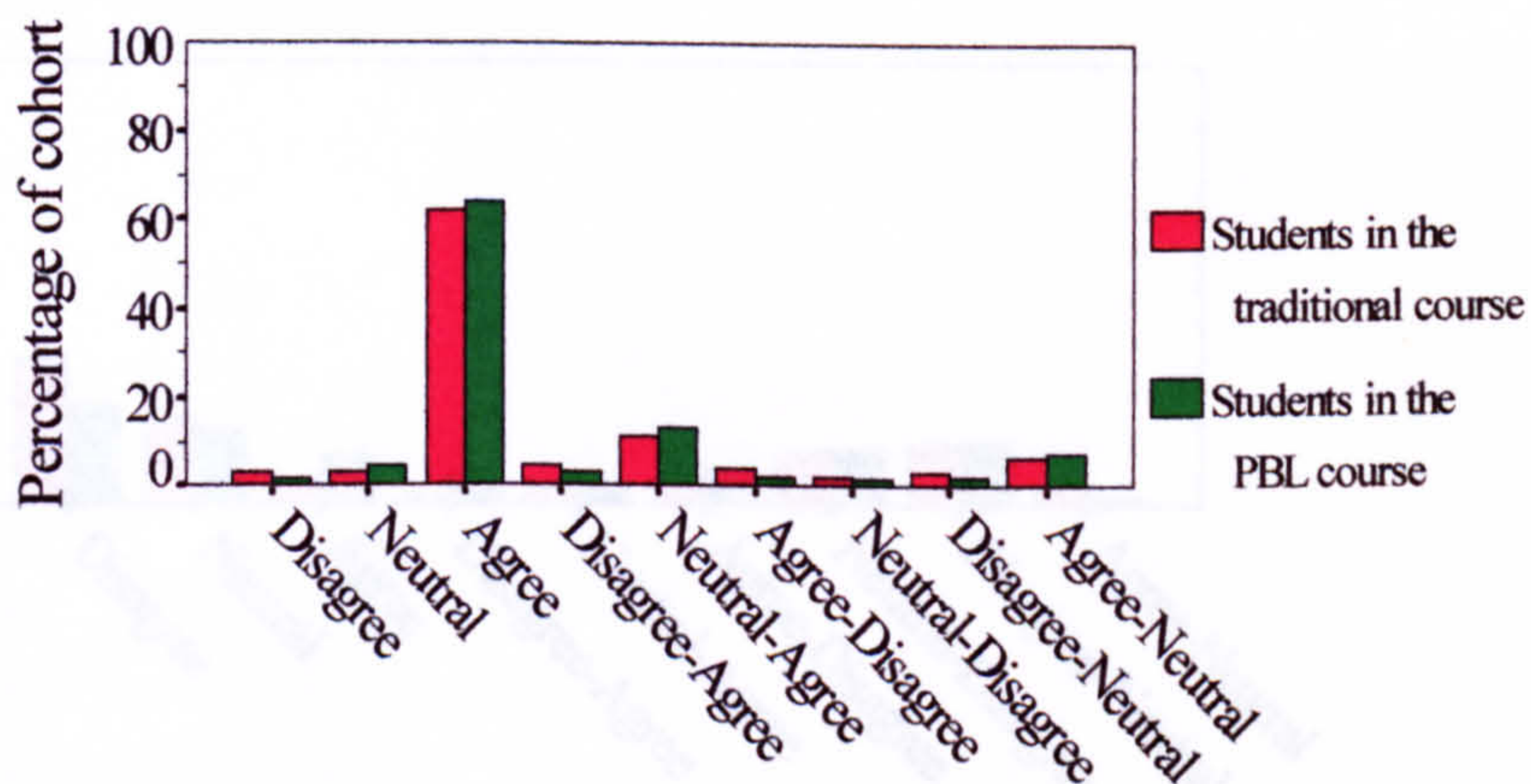


Fig. 22 Changes in responses during first year

'Sometimes I find I learn more about a subject by discussing it with other students than I do by sitting and revising at home.'

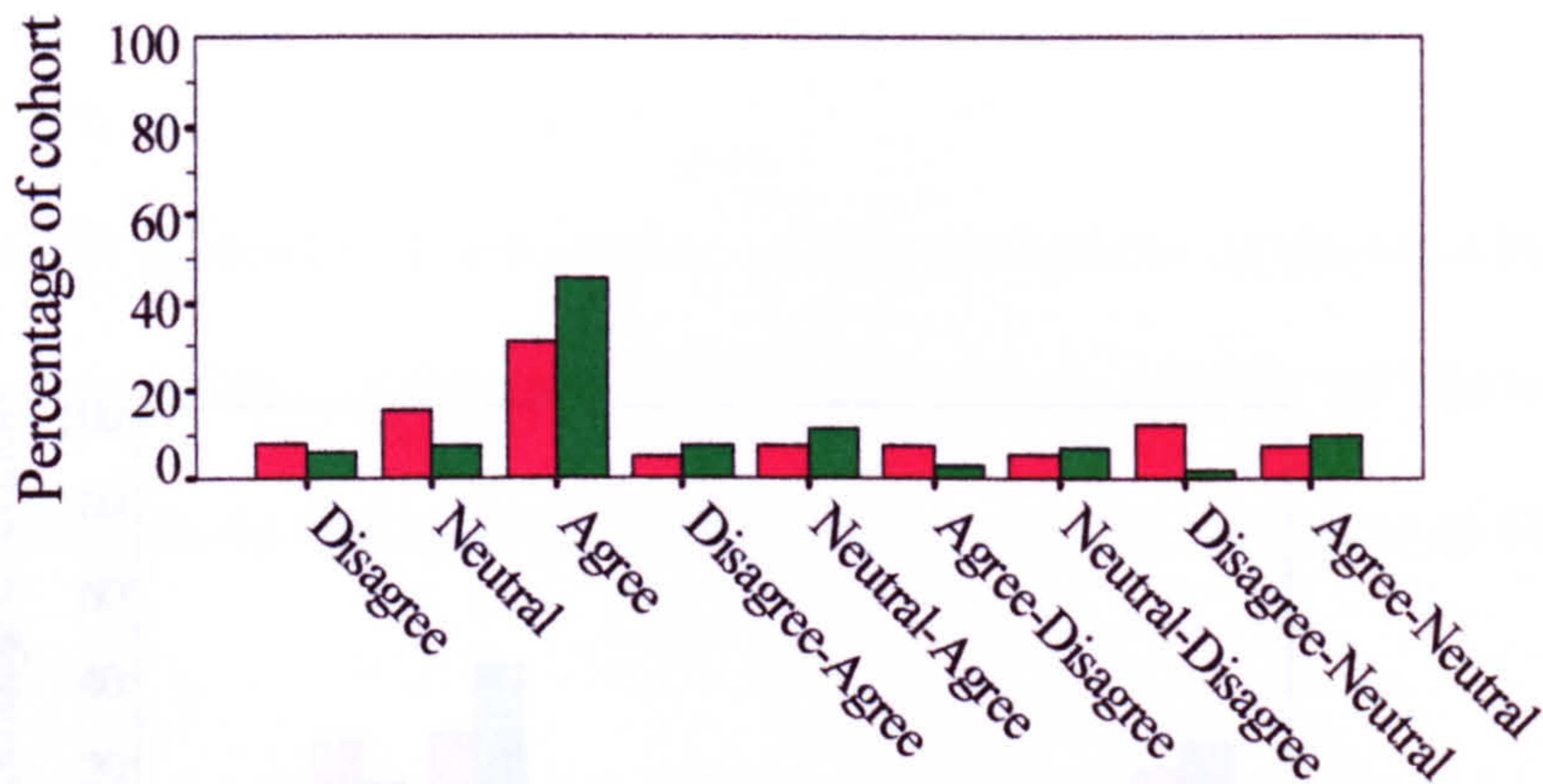


Fig. 23 Changes in responses during first year

'If I had the choice of written comments or a specific mark at the end of a piece of coursework, I would choose the comments.'

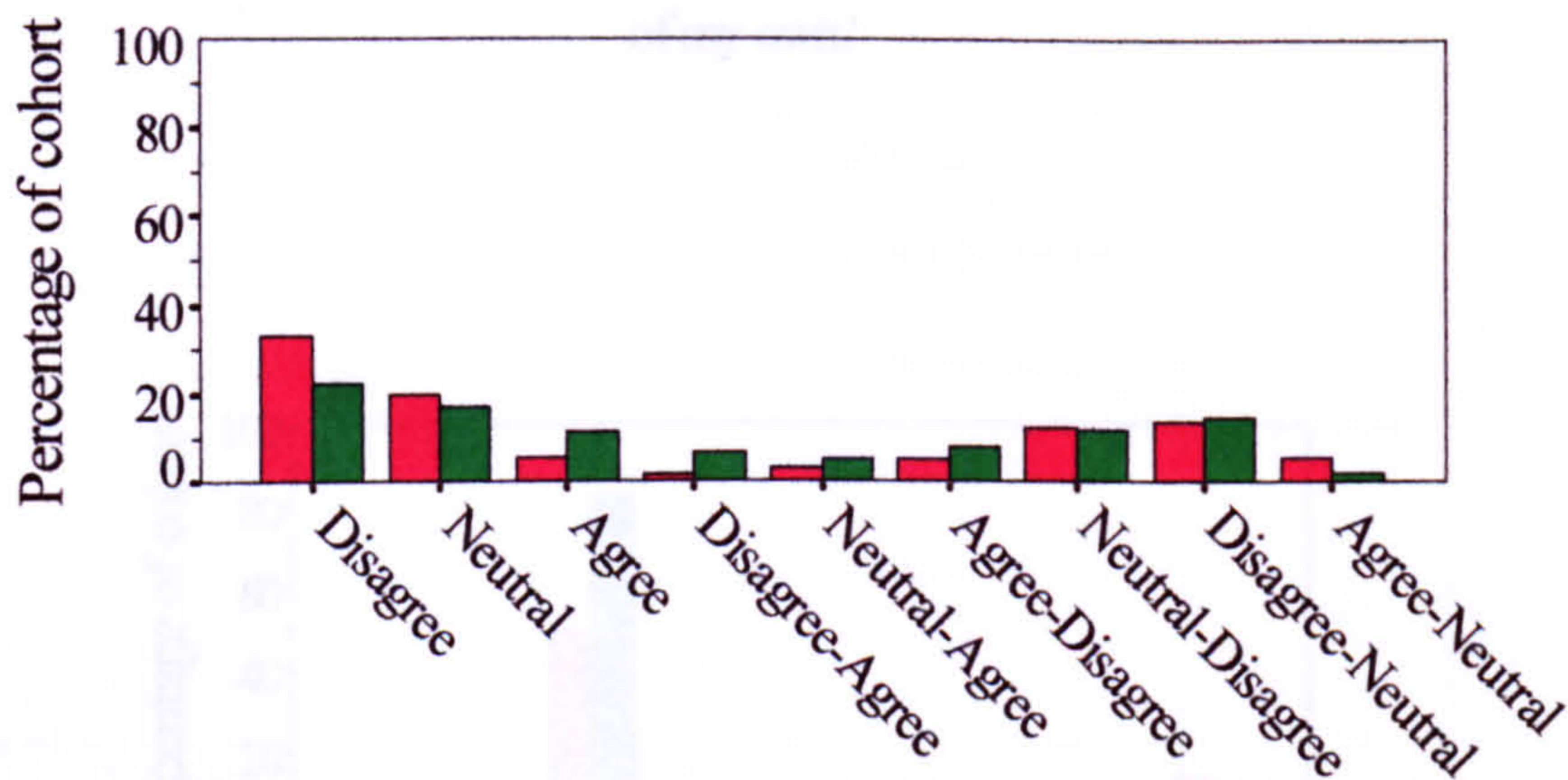


Fig. 24 Changes in responses during first year

'I enjoy undertaking tasks where the lecturer/ member of staff doesn't specify exactly what has to be done and it is left to me to decide.'

- Students in the traditional course
- Students in the PBL course

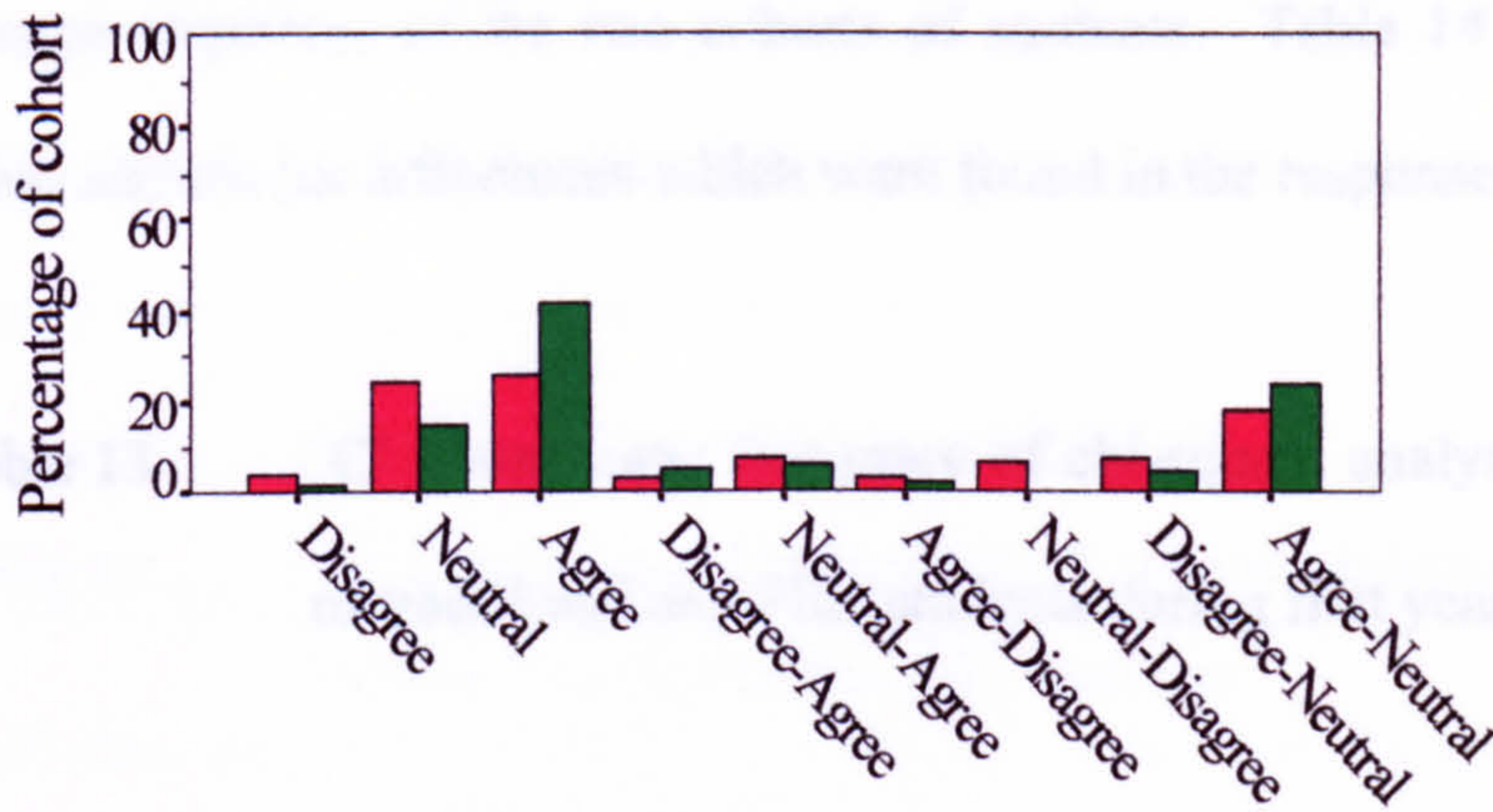


Fig. 25 Changes in responses during first year

'I like assessments which give me an opportunity to show I have ideas of my own.'

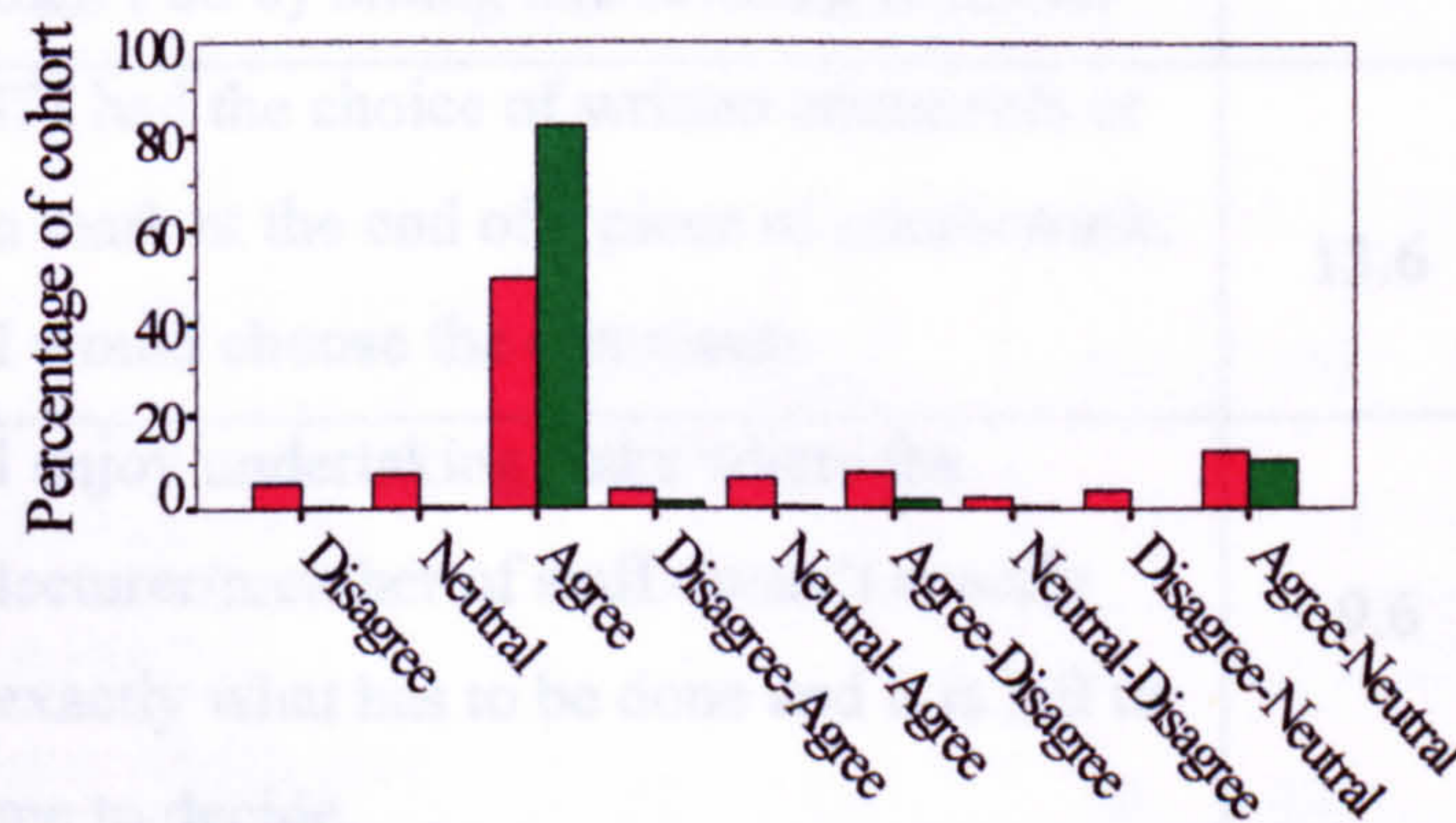


Fig. 26 Changes in response during first year

'It's good when a number of lecturers/staff are teaching a course because you get not just one but a variety of opinions.'

- Students in the traditional course
- Students in the PBL course

* 25% of the cells in the chi-square analysis had an expected frequency of <5

Table 13 summarises the results of the chi-square analyses which compared the change responses of the two cohorts of students. Table 14 shows the direction of those significant differences which were found in the responses of the two cohorts.

Table 13 'C' Statements: Summary of chi-square analyses of change responses of traditional and PBL students during first year

	'C' Statement	χ^2	<i>df</i>	<i>p</i>
3.	Sometimes I find I learn more about a subject by discussing it with other students than I do by sitting and revising at home.	2.0	5	0.84*
6.	If I had the choice of written comments or a mark at the end of a piece of coursework, I would choose the comments.	13.6	5	0.02
9.	I enjoy undertaking tasks where the lecturer/member of staff doesn't specify exactly what has to be done and it is left to me to decide.	9.6	5	0.09
12.	I like exams/assessments which give me an opportunity to show I have ideas of my own.	15.6	5	0.01
15.	It's good when a number of lecturers/staff are teaching a course because you get not just one but a variety of opinions.	37.1	5	0.00*

* 25% of the cells in the chi-square analysis had an expected frequency of <5

Two of the statements, 6 and 12, which concerned assessment, showed a clear significant difference in responses on the part of the students in the different courses. Table 14 details the response category in each statement which showed the largest percentage differences between the two cohorts of students. Also included is the relevant information from responses to statement 15. These data were drawn from Tables xxii to xxvi in Appendix 4.

Table 14 'C' Statements: Category of response showing largest differentiation between traditional and PBL students

'C' Statement	Traditional Students (N=126)		PBL Students (N=134)		Response Category
	n	%	n	%	
	6. If I had the choice of written comments or a mark at the end of a piece of coursework, I would choose the comments.	38	31	46	
12. I like exams/ assessments which give me an opportunity to show I have ideas of my own.	32	26	56	42	'Agree': No change
15. It's good when a number of lecturers/staff are teaching a course because you get not just one but a variety of opinions.	61	49	109	83	'Agree': No change

In contrast with the findings for the 'A' statements, in two of these 'C' statements (6 and 12), a higher percentage of the students in the PBL course agreed with the views expressed, and, as before, the agreement was there at both the beginning and the end of the first year. In the case of statement 15, the results of the chi-square test itself require to be interpreted with considerable caution, as indicated in the table above, but it is worth observing that the responses of each cohort followed the same trend as those for the other two statements. The three statements referred to the students' preferred forms of feedback (qualitative vs quantitative) on course assignments, the desire for exams/assessments allowing scope for the student's own ideas, and the value of a variety of opinions that comes from having a number of staff teaching on a course.

A fourth statement (9), although not producing differences in response patterns in the two groups of students at the 5% level of significance, provides some evidence of a similar trend to that shown in the three above. This statement focused on the extent to which the student enjoyed a less directive approach on the part of staff in relation to learning tasks which allowed the student more scope in deciding what to do. Here it was more difficult to identify a single category of response that strongly differentiates the two groups of students. Rather more of the students in the traditional course (33%, compared with 22% of the students in the PBL course) disagreed with this statement throughout the academic year, and rather more of the students in the PBL course (12%, compared with 5% of students in the traditional course) changed to agree with this view by the end of the year. As can be noted, neither the actual percentages of students in each group nor the differences between them in these instances were especially large. Also, by the end of the year, 40% of the traditional

group and 34% of the PBL group opted for a 'Neutral' response, and this was made up of almost equal percentages, in both cohorts, of students who had changed to 'Neutral' during the year and those who began and ended the year with this view.

Finally, the fifth 'C' statement (3), which focused on the value of learning through discussion of course material with fellow students, displayed no significant differences in response patterns of the two cohorts of students. More than 60% of students in both courses (62% of students in the traditional course; 64% of students in the PBL course) began and ended the course by agreeing that this was valuable, and, in addition, a small number (16%) in each group changed by the end of their first year to agree with this statement. Given the extensive amount of time spent in group work by students in the PBL course, one might have expected relatively more of these students to have endorsed this statement. On the other hand, the finding that the value of learning from their peers was acknowledged more or less equally by students in both the traditional and PBL courses was an encouraging one.

6.4 Changes in response to 'B' statements during first year: comparisons of students in the traditional and problem-based courses

The pattern of responses of each group to the five 'B' Likert-type statements was less predictable, since the lack of confidence, security and direction reflected in these statements could be reported by students in either type of courses. Figures 27 to 31 show the change responses to each of the 'B' statements (statements 2, 5, 8, 11 and 14) by the two cohorts of students.

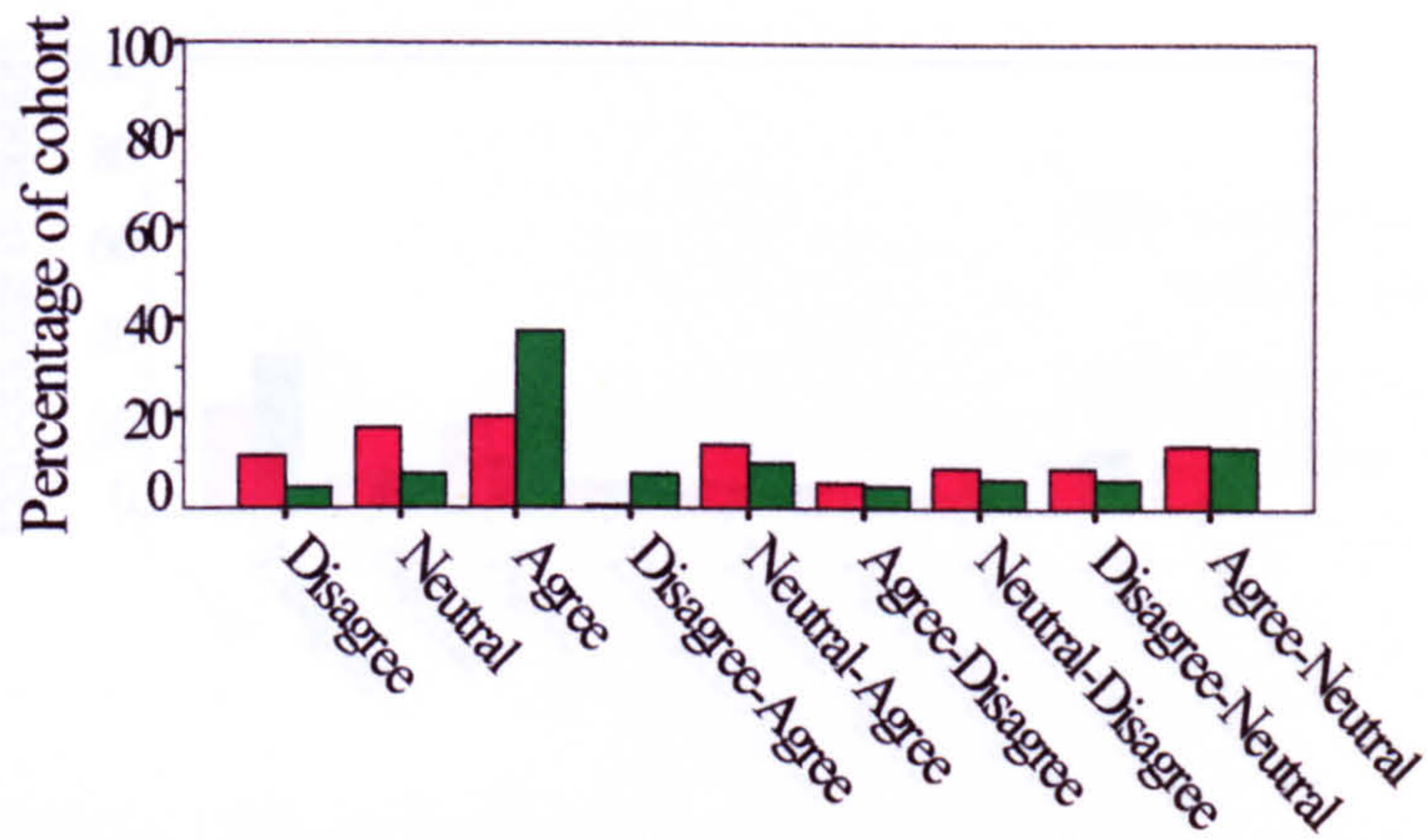


Fig 27 Changes in responses during first year

'Sometimes there seem to be so many ways of looking at the course that I feel confused about what is right and wrong.'

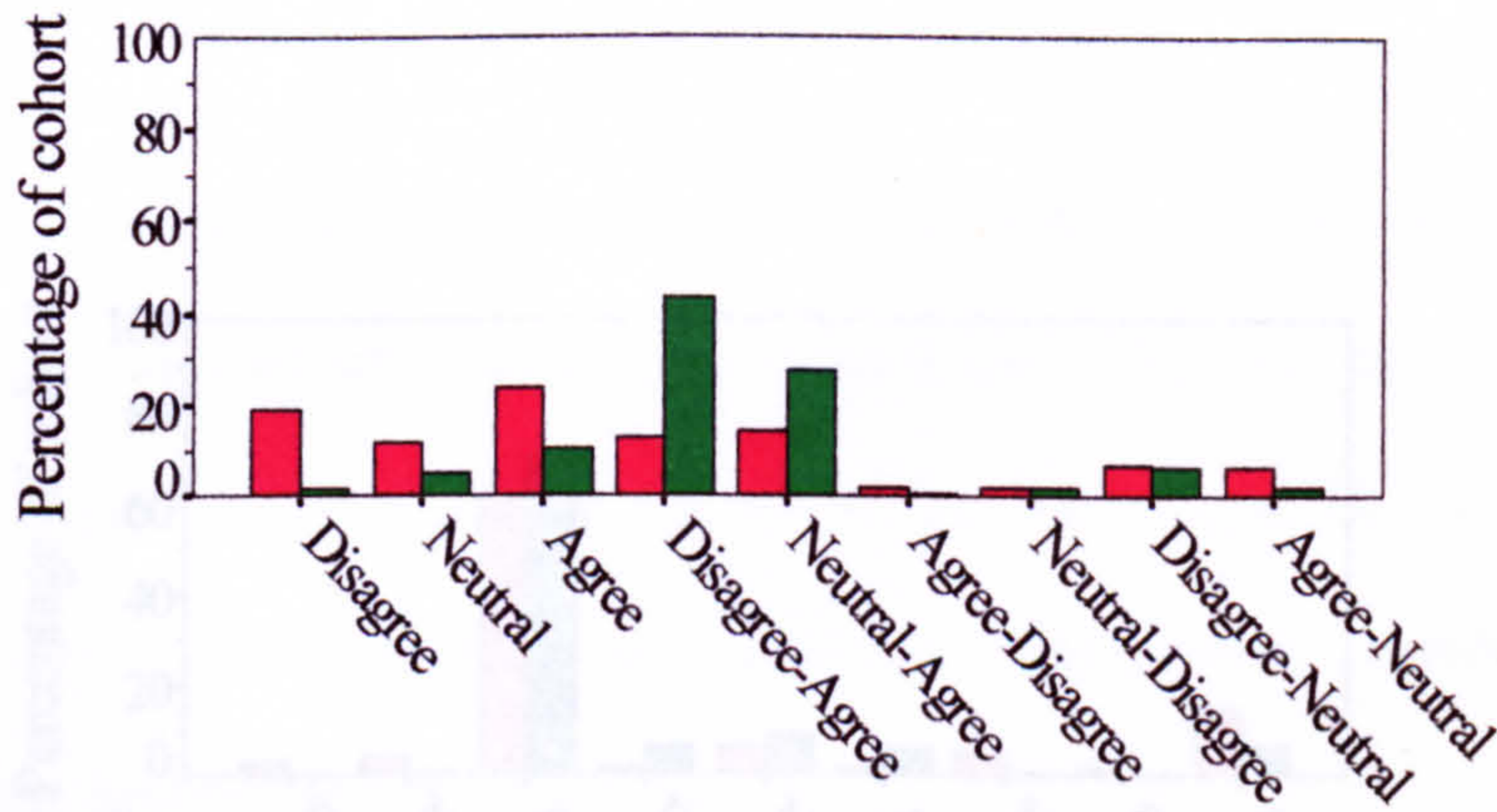


Fig 28 Changes in responses during first year

'If I find conflicting views on a topic, I like to know which is the right one.'

- Students in the traditional course
- Students in the PBL course

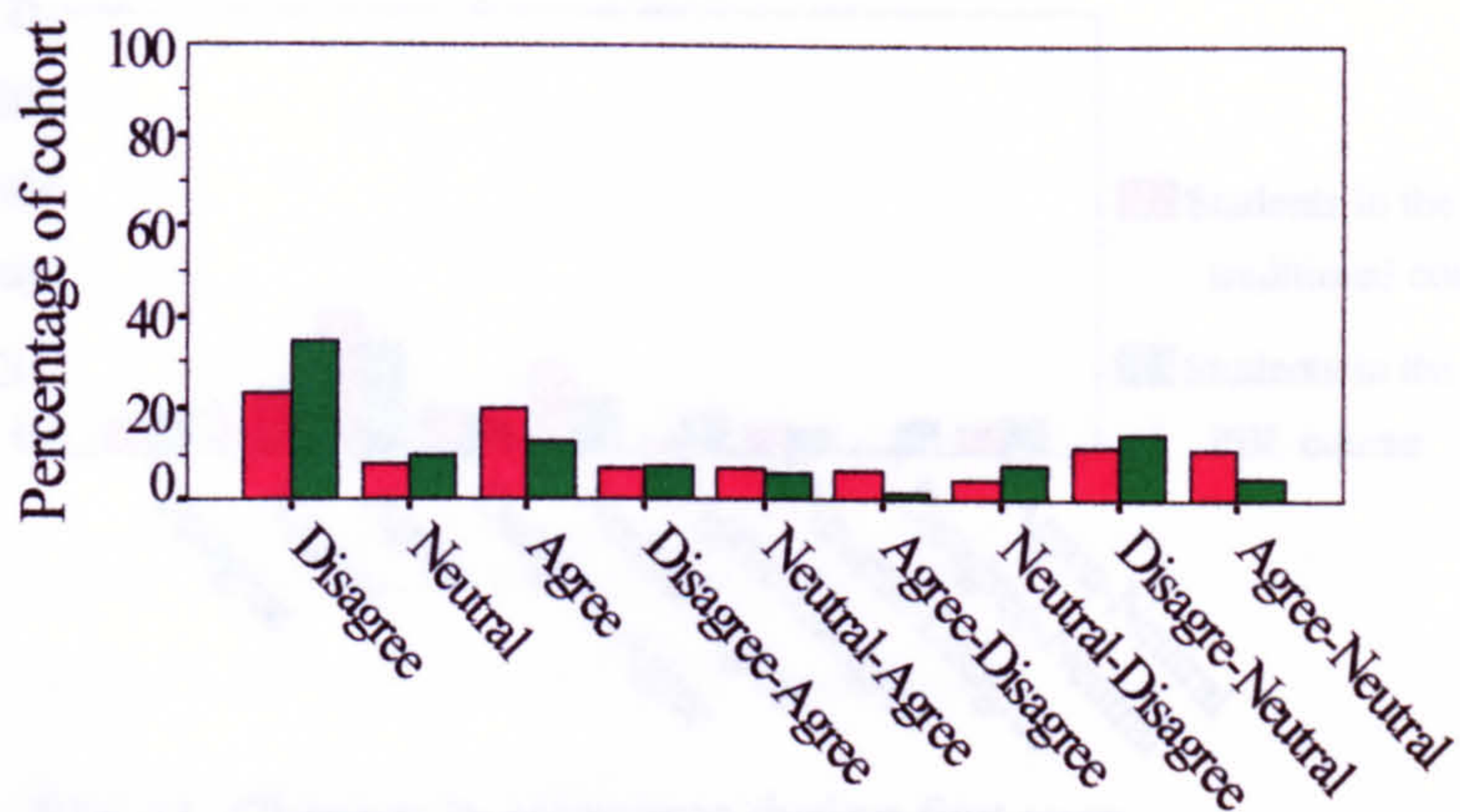


Fig 29 Changes in responses during first year

'I feel uncomfortable when I am left to make up my own mind about a subject, not knowing how the lecturer feels / the opinions of staff.'

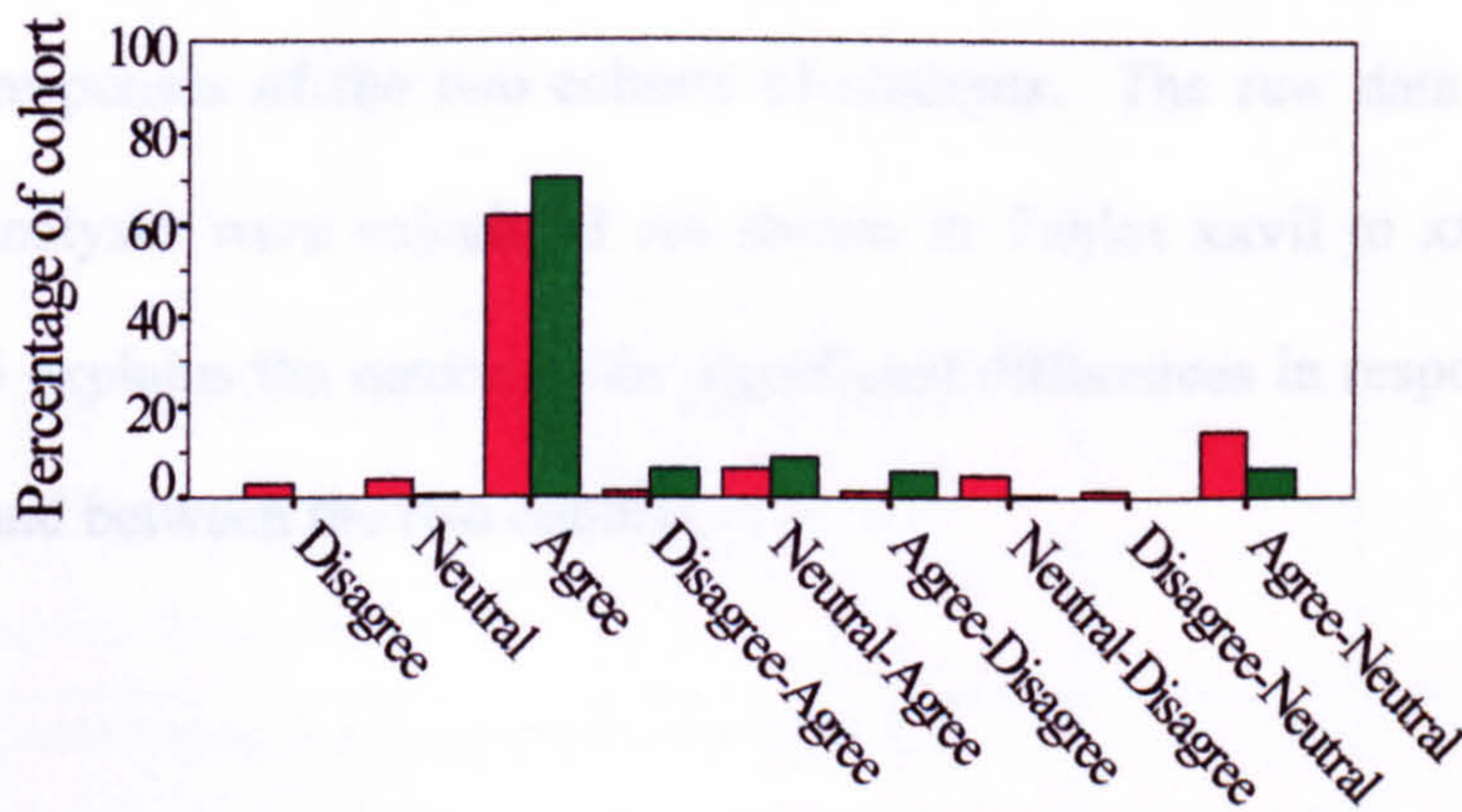


Fig 30 Changes in responses during first year

'The worst thing about a vague assignment is that you don't know exactly what the lecturer/staff require from you.'

- Students in the traditional course
- Students in the PBL course

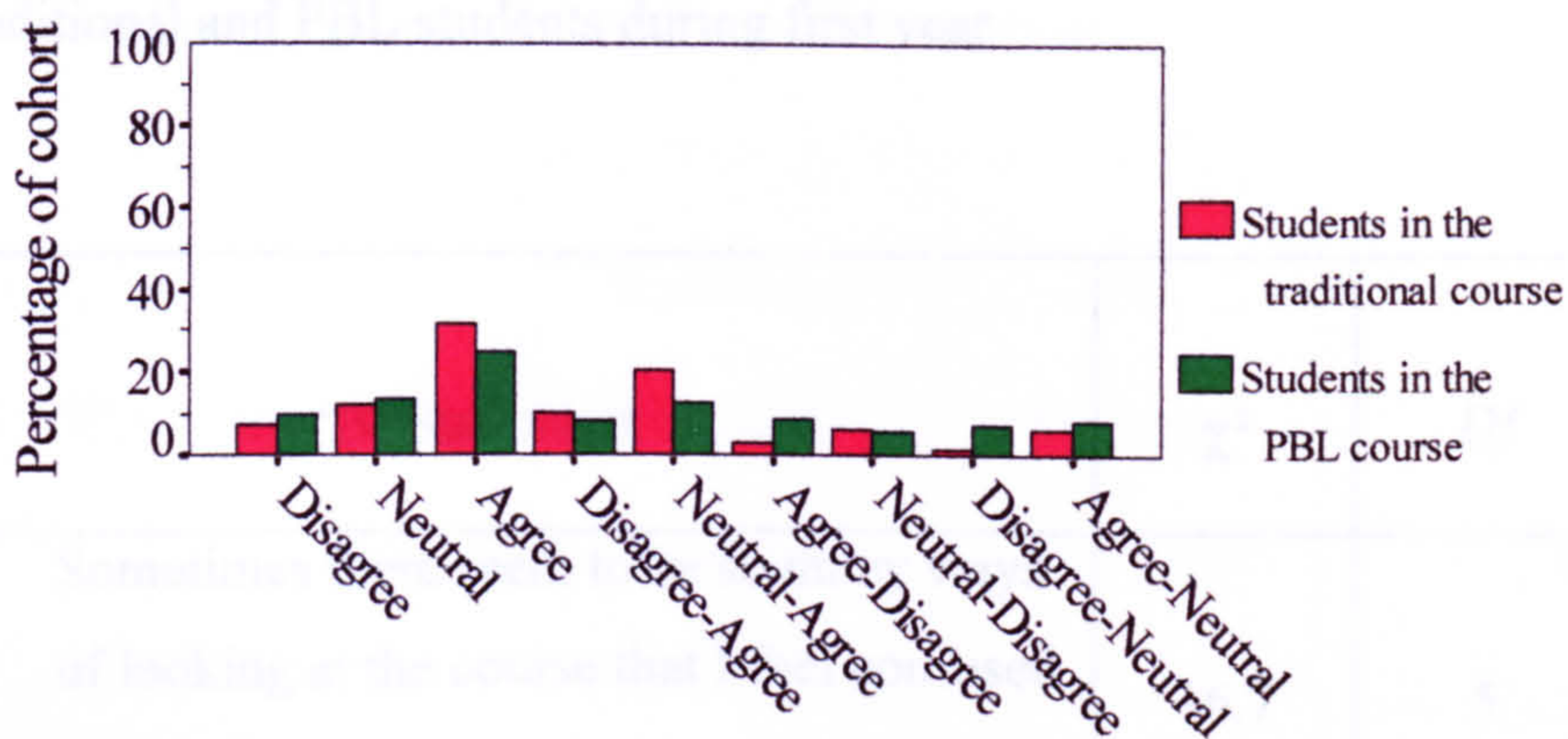


Fig. 31 Changes in responses during first year

'I sometimes choose a topic or a way of answering a ... question which I ... believe staff favour, in order to get higher marks.'

Table 15 summarises the results of the chi-square analyses which compared the change responses of the two cohorts of students. The raw data on which the chi-square analyses were calculated are shown in Tables xxvii to xxxi in Appendix 4. Table 16 explains the nature of the significant differences in response patterns which were found between the two cohorts.

14. I sometimes choose a topic or a way of answering an exam question which I know the lecturer likes / a question which I believe staff favour, in order to get higher marks.

* One-third of the cells in the chi-square analysis had an expected frequency of 5.

Table 15 'B' Statements: Summary of chi-square analyses of change responses of traditional and PBL students during first year

	'B' Statement	χ^2	<i>Df</i>	<i>p</i>
2.	Sometimes there seem to be so many ways of looking at the course that I feel confused about what is right and wrong.	16.7	5	0.01
5.	If I read something which doesn't agree with what I have been told in lectures, I prefer to stick with the lecturer's point of view. / If I find conflicting views on a topic, I like to know which is the right one.	57.3	5	0.00
8.	I feel uncomfortable when I am left to make up my own mind about a subject, not knowing how the lecturer feels / the opinions of staff.	6.0	5	0.30
11.	The worst thing about a vague assignment is that you don't know what the lecturer requires from you / exactly what staff require from you.	16.1	5	0.01*
14.	I sometimes choose a topic or a way of answering an exam question which I know the lecturer likes / a question which I believe staff favour, in order to get higher marks.	8.5	5	0.13

* One-third of the cells in the chi-square analysis had an expected frequency of < 5.

Table 16 'B' Statements: Category of response showing largest differentiation between traditional and PBL students

'B' Statement	Traditional		PBL		Response Category
	Students		Students		
	(N=126)		(N=134)		
	n	%	n	%	
2. Sometimes there seem to be so many ways of looking at the course that I feel confused about what is right and wrong.	24	20	50	38	'Agree': No change
5. If I read something which doesn't agree with what I have been told in lectures, I prefer to stick with the lecturer's point of view. / If I find conflicting views on a topic, I like to know which is the right one.	34	27	95	71	Changed to 'Agree'
	24	19	2	2	'Disagree': No change
11. The worst thing about a vague assignment is that you don't know what the lecturer requires from you/exactly what staff require from you.	77	62	94	70	'Agree': No change
	10	8	21	16	Changed to 'Agree'

As can be seen from Table 16, the two statements (2 and 5) which showed significantly different patterns of responses from the two cohorts reflected higher levels of agreement by the end of the first year from the students in the PBL course. A similar trend was shown for the third statement (11), where the chi-square analysis needs to be interpreted cautiously.

With reference to statement 2, almost twice as many students in the problem-based course agreed that they felt '*confused about what was right and wrong*' as a result of there being '*so many ways of looking at the course*'. The wording of statement 2 is somewhat ambiguous and, as a result, could be difficult for respondents to answer clearly. Two elements are contained in this single statement - '*many ways of looking at the course*' and feelings of confusion '*about what is right and wrong*' - yet the respondent is required to provide a single answer to these two elements in the form of agreement/disagreement/neutral response. It is feasible that a student might wish to agree with the first element but disagree with the second element, that is, he/she agrees that there are many ways of looking at the course but disagrees that this is causing him/her confusion. In this situation, the student is likely to find it difficult to respond to the statement. It could be argued, therefore, that the meaning of the students' answers to this particular question cannot be interpreted clearly. However, this argument may be less convincing in the case of students who indicate agreement with the statement and it seems not unreasonable to conclude that in this instance students are agreeing with both elements in the statement.

The two cohorts of students demonstrated highly significant differences in response patterns to statement 5 during first year. Almost three-quarters of the students in the problem-based course but only about a quarter of those in the traditional course changed their view to agree with the statement by the end of first year. Since one of the aims of the PBL course is to encourage a critical, independent approach to learning, this result is a disappointing one since it suggests an expectation on the part of students that there are 'right' and 'wrong' answers to problems. This particular statement was one of those that were revised for the problem-based students in the form of the questionnaire that they received towards the end of first year. The statement they received at the beginning of their first year read as follows: *'If I read something that doesn't agree with what I have been told in lectures, I prefer to stick with the lecturer's point of view.'* This was amended at the end of their first year to the following: *'If I find conflicting views on a topic, I like to know which is the right one.'* It is possible that students interpreted *'the right one'* in the latter version to mean 'that view which is best supported by the existing evidence.' However, given the response of the problem-based students to statement 2, as discussed above, it does seem more likely that they were seeking the perceived security of knowledge that has 'the right answer'. Many of the PBL students who changed their view to agree with this statement at the end of the year changed from a position of disagreement with it at the beginning of first year and some changed to agreement from their initial 'Neutral' position.

This pattern amongst the problem-based students of a growing sense of confusion, of not knowing who or what is accurate or inaccurate, by the end of their first year, was also evident in the responses to statement 11, which referred to '*not knowing what staff require*' of students as the '*worst thing about a vague assignment*'. In both cohorts, the majority agree with the statement by the end of first year but this is more marked amongst those in the problem-based course.

6.5 Summary of changes in response to the Likert-type statements during first year: comparison of students in the traditional and problem-based courses

Almost all of the 'A' statements and fewer of the 'C' statements showed significant differences in response between the two cohorts of students. These differences tended to be in the direction that might be expected given the features associated with the different learning environments provided by the two curricula. For instance, reflecting a more 'C'-type of position, significantly more of the students in the problem-based course favoured assessments which allowed them to demonstrate their own ideas and preferred written comments on coursework rather than simply a mark. Also, significantly more of the PBL students were not in favour of a course which included only topics on which they would be assessed. They did not see it as a waste of time to work on problems which had ambiguous solutions nor did they agree with the suggestion that medicine was a good area to study because its subject matter was

clear-cut. In contrast, significantly more of the students in the traditional course thought it was the responsibility of staff to provide students with all the information they required to pass the course, an 'A'-type stance. On the whole, these responses represented a maintenance of views endorsed at the beginning of first year rather than a change to them by the end of the year.

The direction of the differences in responses to the 'B' statements between students in the problem-based course and those in the traditional course suggested greater uncertainty and lack of confidence amongst the former. Moreover, there was some evidence that, not only was the uncertainty maintained during the year, but also that it had increased by the end of it. For example, significantly more students in the PBL course thought that sometimes there seemed to be so many ways of looking at the course they felt confused about what was right and wrong. Also, by the end of their first year, a significantly higher percentage of the PBL students had changed their original response and instead, by the end of the year, agreed that, if they discovered conflicting views on a topic, they liked to know which view was the 'right one'.

CHAPTER 7

ANALYSES OF PERSONALITY MEASURES

7.1 Introduction

The main reason for obtaining measures of personality from students in the two cohorts was to determine if those students who appeared to have a 'C'-type stance in respect of important elements associated with their learning experience (as measured by the learning perceptions questionnaire) scored relatively highly on personality dimensions that seemed to reflect features similar to 'C-ness', such as independence of thought, a questioning approach, and creativity. The *NEO Five-Factor Inventory* (Costa and McCrae, 1991) was chosen as the personality measure for the study since it included at least one factor – *openness to experience* – which incorporated 'C'-type characteristics, together with other factors, such as *extraversion* and *neuroticism*, which have been investigated in other studies of medical students (e.g., Zeldow, Daugherty and Leksas, 1987).

The response rates for the *NEO-FFI* are shown in Table 17.

Table 17 **Response rates associated with the *NEO Five Factor Inventory***

<i>Personality Inventory</i>	Number returned		Response rate	
	Tradit. course	PBL course	Traditional course	PBL course
Total returned	132	164	56% of 237	70% of 235
Returned by students who had also returned learning perceptions questionnaire on both Occasions	75	96	60% of 126	72% of 134

* 237 students were enrolled in the first year of the 'old' course when the first learning perceptions questionnaire was distributed

** 235 students were enrolled in the first year of the PBL course when the first learning perceptions questionnaire was distributed

For the *NEO-FFI*, there were satisfactory response rates in both cohorts for those students who had also completed both learning perceptions questionnaires during first year.

Brief descriptions of high and low scorers on the five personality factors measured by the *NEO Five-Factor Inventory* are given in Table 18.

Table 18 *NEO Five-Factor Inventory*: Descriptions of high and low scorers on the five personality factors

<i>Personality Factor</i>	High scorer	Low scorer
<i>Openness to experience</i>	Intellectual curiosity; independence of judgement; willing to question authority; divergent thinker; prefers variety; aesthetic sensitivity; active imagination; attentive to inner feelings	Conventional in behaviour; conservative in outlook; mild; prefers the familiar to the novel; cautious
<i>Agreeableness</i>	Altruistic; sympathetic to others; eager to help others; believes others will be helpful in return	Competitive; sceptical of the intentions of others; egocentric; antagonistic
<i>Conscientiousness</i>	Determined; will to achieve academically and occupationally; purposeful; scrupulous; punctual; reliable	Less exacting in applying their principles; more lackadaisical in working towards their goals; more hedonistic
<i>Extraversion</i>	Sociable; cheerful; assertive; energetic; talkative; optimistic; likes excitement and stimulation	Reserved; independent; even-paced; prefers own company
<i>Neuroticism</i>	Copes more poorly than others with stress; tends to experience negative emotions, e.g., fear, anger, embarrassment, etc; prone to having irrational ideas	Able to cope with stressful situations; usually calm, even-tempered and relaxed

(Adapted from Costa and McCrae, 1992: 14-16)

The relationships between 'C'-ness, as measured by the learning perceptions questionnaire, and scores on each of the above personality factors are reported in Section 7.3.3. However, for two reasons, it was considered important to summarise the general results from the *NEO Five-Factor Inventory* for the two cohorts of students: firstly, to set a general context for the perceptions of learning-personality relationship described in Section 7.3.3; secondly, to provide a basis on which decisions could be made about the most appropriate groupings of students for inclusion in the correlational analyses of personality and learning perceptions, e.g., whether the results of male and female students within each cohort should be analysed separately.

7.2 Scores on the dimensions of the *NEO Five-Factor Inventory*

Since gender differences in personality dimensions are commonly found, it was decided to analyse the *NEO* scores of male and female students in each of the two courses by means of the non-parametric test, the Kruskal-Wallis one-way analysis of variance by ranks. (The mean scores, for each of the five personality dimensions, of male and female students in both courses are shown in Appendix 5, together with the associated norms.) Table 19 reports the results of the Kruskal-Wallis *ANOVA* tests for the *NEO-FFI* dimensions of *openness to experience*, *agreeableness*, *conscientiousness*, *extraversion* and *neuroticism*.

Table 19 Results of Kruskal-Wallis analyses of scores on *NEO-Five Factor Inventory*: male and female students in traditional and PBL courses

<i>Personality Factor</i>	Mean Rank	n	χ^2	<i>df</i>	<i>p</i>
<i>Openness to experience:</i>					
Male traditional students	87	34	0.28	3	0.96
Female traditional students	89	40			
Male PBL students	83	32			
Female PBLstudents	86	65			
<i>Agreeableness:</i>					
Male traditional students	56	34	15.8	3	0.00
Female traditional students	90	40			
Male PBL students	96	32			
Female PBLstudents	94	65			
<i>Conscientiousness:</i>					
Male traditional students	78	34	6.2	3	0.10
Female traditional students	77	40			
Male PBL students	81	32			
Female PBLstudents	98	65			
<i>Extraversion:</i>					
Male traditional students	77	34	4.9	3	0.18
Female traditional students	76	40			
Male PBL students	90	32			
Female PBLstudents	95	65			
<i>Neuroticism:</i>					
Male traditional students	95	34	18.1	3	0.00
Female traditional students	101	40			
Male PBL students	54	32			
Female PBLstudents	87	65			

There were no significant associations among gender, course and scores of *openness to experience* and *extraversion*. In those analyses in which significant differences were found – i.e., in relation to *agreeableness* and *neuroticism* – further analyses, using the Mann-Whitney *U* Test, were carried out to determine whether there were significant cohort or gender differences. Since the result of the Kruskal-Wallis analysis of the *conscientiousness* scores showed a trend that was significant at the 0.1 level, the *conscientiousness* scores were also analysed by means of the Mann-Whitney *U* Test.

7.2.1 Further analyses of scores of *agreeableness*, *neuroticism* and *conscientiousness*: comparison of male and female students in each course

The results of the Mann-Whitney *U* Test for male and female students in the two courses are shown in Tables 20 and 21.

Table 20 Results of the Mann-Whitney *U* analyses of scores of *agreeableness*, *neuroticism* and *conscientiousness*: comparison of male and female students in the traditional course

<i>Personality Factor</i>	Male Students		Female Students		<i>z</i>	<i>p</i>
	Mean Rank	<i>n</i>	Mean Rank	<i>n</i>		
<i>Agreeableness</i>	29	34	45	40	-3.08	0.00
<i>Neuroticism</i>	36	34	39	40	-0.58	0.56
<i>Conscientiousness</i>	38	34	37	40	-0.03	0.97

Table 21 Results of the Mann-Whitney *U* analyses of scores of *agreeableness*, *neuroticism* and *conscientiousness*: comparison of male and female students in the PBL course

<i>Personality Factor</i>	Male Students		Female Students		<i>z</i>	<i>p</i>
	Mean Rank	<i>n</i>	Mean Rank	<i>n</i>		
<i>Agreeableness</i>	50	32	49	65	-0.13	0.90
<i>Neuroticism</i>	37	32	55	65	-3.07	0.00
<i>Conscientiousness</i>	43	32	52	65	-1.46	0.14

In both traditional and PBL courses, male and female students differed significantly in their personality scores in one of the five dimensions measured by the *NEO Five-Factor Inventory*, with female students gaining higher scores in both instances. The specific personality dimension was not the same in both cohorts: amongst students in the traditional course, women scored more highly on *agreeableness*, while, in the PBL course, women students gained higher scores on *neuroticism*. The *NEO* test norms for college-age males and females (Appendix 5) indicate that such gender differences in mean scores on these two dimensions are not atypical.

The importance of these differences for the present study is that they suggested that, in the subsequent correlational analyses of learning perceptions and personality, separate gender analyses should be carried out in relation to two correlations: i) between *agreeableness* and learning perceptions in the case of the traditional students and ii) between *neuroticism* and learning perceptions for the PBL students.

7.2.2 Further analyses of scores of agreeableness, neuroticism and conscientiousness: comparison of male and female students across courses

Table 22 shows the comparisons of personality scores of male students in the traditional and PBL courses while Table 23 shows similar comparisons for female students in the two courses.

Table 22 Results of the Mann-Whitney *U* analyses of scores of *agreeableness*, *neuroticism* and *conscientiousness*: comparison of male students in traditional and PBL courses

<i>Personality Factor</i>	Male traditional students		Male PBL students		<i>z</i>	<i>p</i>
	Mean Rank	<i>n</i>	Mean Rank	<i>n</i>		
<i>Agreeableness</i>	26	34	41	32	-3.07	0.00
<i>Conscientiousness</i>	33	34	38	32	-0.11	0.91
<i>Neuroticism</i>	41	34	25	32	-3.39	0.00

Table 23 Results of the Mann-Whitney *U* analyses of scores of *agreeableness*, *neuroticism* and *conscientiousness*: comparison of female students in traditional and PBL courses

<i>Personality Factor</i>	Female traditional students		Female PBL students		<i>z</i>	<i>p</i>
	Mean Rank	<i>n</i>	Mean Rank	<i>n</i>		
<i>Agreeableness</i>	51	40	54	65	-0.45	0.65
<i>Conscientiousness</i>	45	40	58	65	-2.21	0.03
<i>Neuroticism</i>	58	40	50	65	-1.43	0.15

Female students in the PBL course were significantly more *conscientious* than their female counterparts in the traditional course. Male students in the PBL course were significantly more *agreeable* than their male counterparts in the traditional course while the latter were significantly more *neurotic* than the former. As with the data in Tables 20 and 21, these significant differences are important for the subsequent correlational analyses of the relationship between learning perceptions and personality. They suggested that, although Tables 20 and 21 showed that there was no significant gender difference in either cohort in *conscientiousness*, it would be unwise to combine these scores from the two cohorts, given the differences in

conscientiousness between female students in the two courses. The significant differences between the male students in the two courses in *agreeableness* and *neuroticism* (Table 22), taken in conjunction with the significant gender differences found above (Tables 20 and 21), indicated the necessity for separate cohort and gender analyses of correlational data.

As mentioned earlier in Section 7.2, the only dimensions which showed neither cohort nor gender differences were *extraversion* and *openness to experience*, this latter being the personality dimension of particular interest in terms of its possible correlation with learning perceptions, i.e., with a 'C'-type perspective on learning. The absence of cohort and gender differences suggested that it was feasible to combine in a single correlational analysis personality scores of *openness to experience* from the students in the two courses *and* from male and female students within each cohort.

7.3 Correlations between students' personality traits and their perceptions of learning

7.3.1 Introduction

It was necessary to devise a means of relating students' personality scores on the five dimensions of the *NEO Five-Factor Inventory* to their responses in the questionnaire on learning perceptions. Initially, given the 'soft' nature of the data gathered in the

latter questionnaire in particular, it was considered appropriate to use a categorical form of analysis to examine the change, during the first undergraduate year, in each student's response to each question in the learning perceptions questionnaire, and to relate change 'forwards'/change 'backwards'/absence of change to personality scores on each of the five dimensions. However, this somewhat piecemeal approach yielded no meaningful patterns in the data at all and it became evident that an attempt would need to be made to derive a single score from the learning perceptions questionnaire for each student. It was intended that this single score would give an indication, albeit approximate, of the 'C-ness' of the student's perceptions of learning within Perry's scheme. It is fully acknowledged that the data which were obtained from the learning perceptions questionnaire were qualitative in nature but equally it became clear that, in order to establish any possible links between this data and that obtained from the personality inventory, approximations to quantitative differences would require to be imposed on the responses obtained from the questionnaire on learning perceptions.

7.3.2 Rationale for the allocation of 'distance from A' scores to 'Agree', 'Disagree' and 'Neutral' responses

The single score eventually derived from each student's responses to the learning perceptions questionnaire was named the 'distance from A' score and was based on the student's responses to the set of 15 statements in which respondents were asked to rate their agreement/disagreement on a five-point scale, where 5 = *Strongly Agree*, 4 =

Agree, 3 = *Neutral*, 2 = *Disagree*, and 1 = *Strongly Disagree*. In an earlier study, in which the original form of the learning perceptions questionnaire was designed, Harvey (1994) analysed responses to these statements by including only the 'Agree' responses and excluding the 'Disagree' responses. This process of analysis was defended by Harvey on the grounds that, in contrast with 'Disagree' responses, there was greater consensus amongst her panel of experts about the meaning of an 'Agree' response to any of the statements, that is, an 'Agree' response was judged to reflect, more clearly than a 'Disagree' response, an 'A' or 'B' or 'C' position on the part of the respondent.

Gray (1997) took issue on two counts with Harvey's approach to the analysis of these data. Drawing on unpublished work by Hadden and McGuire in which they re-examined the original protocols of the panel of experts from Harvey's study, he argued convincingly that an 'Agree' response to a statement also may not reflect a single, clear-cut position. His second point concerned 'Disagree' responses – since a 'Strongly Disagree' or 'Disagree' response also represented a specific answer to a statement, it should not be treated in the same way as a 'No Response' or 'Neutral' answer. In addition, ignoring a considerable quantity of data in this way is likely to increase bias in any data analyses. For these reasons, it was decided that, in the current study, all response categories would be included in the attempt to devise a 'distance from A' score, while recognising that the calculation of such a score imposed quantitative differences on what were essentially qualitative differences amongst the response categories.

Construction of the 'distance from A' score was underpinned by one factor that is prominent in the literature on Perry's scheme of cognitive development, namely that the positions in Perry's framework have been regarded as representing a hierarchical progression from the lower, simple stages through the intermediate positions to arrive at the higher positions in his scheme (Perry, 1981). Positions 'A', 'B', and 'C' are viewed as stages along a continuum in which a student's progression to a 'C' position requires him/her to pass from an 'A' position *through* a 'B' position in order to reach 'C'. This was the basis on which the following scores were devised for 'Agree' responses to 'A', 'B' and 'C' statements in the questionnaire on learning perceptions:

'Agree' Responses:

<u>Type of statement</u>	<u>'Agree' Response</u>	<u>'Distance from A' score</u>	<u>Allocated</u>
A	'Strongly Agree'	0	
A	'Agree'	1	
B	'Strongly Agree'	2	
B	'Agree'	2	
C	'Agree'	4	
C	'Strongly Agree'	5	

The allocation of scores on the above scale was based on the assumption that a student with strongly 'C'-type perceptions was likely to 'Strongly Agree' with 'C' statements (Questions 3, 6, 9, 12, and 15, Appendix 1) in the learning perceptions questionnaire and therefore this response should receive the greatest 'distance from A' score, i.e., '5'. Conversely a student with strongly 'A'-type perceptions was considered likely to 'Strongly Agree' with the 'A' statements (Questions 1, 4, 7, 10, and 13, Appendix 1) and this response should be allocated the smallest 'distance from A' score, i.e., '0'.

The allocation of scores to 'Agree' responses to the 'B' statements (Questions 2, 5, 8, 11, and 14, Appendix 1) was more problematic but it was assumed that these perceptions lay somewhere between the two extremes of the continuum, 'A' to 'C'. The content of each of the five 'B' statements was re-examined by two judges and the

researcher to determine whether it was possible to locate an 'Agree' response closer to one end of the continuum than the other. For each of the five 'B' statements, there was a clear consensus amongst the judges that 'Agree' represented an 'AB' type of response rather than a 'BC' type of response and that the appropriate score lay nearer the 'A' end of the continuum. On this basis, it was thought that a score of '2' (rather than the mid-point, '2.5') was appropriate for these responses. In addition, it seemed less meaningful to distinguish between 'Strongly Agree' and 'Agree' responses in the case of the 'B' statements and so these two responses were allocated the same score.

Extending the above assumptions to the allocation of 'distance from A' scores to the 'Disagree' responses, it seemed logical that a student with strongly 'C'-type views was likely to disagree with 'A' statements and that a student with strongly 'A'-type perceptions would disagree with 'C' statements in the questionnaire. This suggested that 'Disagree' responses to 'A' statements be given relatively higher scores of 'distance from A' than the 'Disagree' responses to 'C' statements. The allocation of 'distance from A' scores was made as follows:

'Disagree' Responses:

<u>Type of statement</u>	<u>'Disagree' Response</u>	<u>'Distance from A' score</u>	<u>Allocated</u>
A	'Strongly Disagree'	5	
A	'Disagree'	4	
B	'Disagree'	3	
B	'Strongly Disagree'	3	
C	'Disagree'	1	
C	'Strongly Disagree'	0	

Again, responses to the 'B' statements were difficult to assign to scores and the same panel of three judges considered the actual meaning of a 'Disagree' response to each of the five 'B' statements, to gauge whether it lay closer to the 'A' or 'C' end of the 'A'→'C' continuum. As before, there was a clear consensus amongst the judges that, in each instance, a 'Disagree' answer was a 'BC' type of response and logically was closer to the 'C' than the 'A' end of the continuum. Therefore a score of '3', not the mid-point ('2.5'), was allocated to 'Strongly Disagree' and 'Disagree' responses. As with the 'Agree' responses to the 'B' statements, it was not considered useful to make a distinction between 'Strongly Disagree' and 'Disagree' responses for the purposes of the scoring scheme, both responses being allocated a score of '3'.

The responses which presented the greatest difficulty in the allocation of appropriate 'distance from A' scores were the 'Neutral' responses to any of the statements, whether 'A', 'B' or 'C'. With the 'A'→'B'→'C' continuum in mind, together with

the scores already allocated to 'Agree' and 'Disagree' responses, it was decided that 'Neutral' responses to each type of statement would be scored as shown:

'Neutral' Responses:

<u>Type of statement</u>	<u>'Neutral' Response</u>	<u>'Distance from A' score</u>
		<u>Allocated</u>
A	'Neutral'	1.5
B	'Neutral'	2.5
C	'Neutral'	3.5

In summary, the 'distance from A' scores allocated to each response in each type of statement – 'A', 'B' and 'C' – are listed below:

<u>Type of statement</u>	<u>Type of Response</u>	<u>'Distance from A' score</u>
A	'Strongly Agree'	0
A	'Agree'	1
A	'Neutral'	1.5
A	'Disagree'	4
A	'Strongly Disagree'	5

B	'Strongly Agree'	2
B	'Agree'	2
B	'Neutral'	2.5
B	'Disagree'	3
B	'Strongly Disagree'	3
C	'Strongly Disagree'	0
C	'Disagree'	1
C	'Neutral'	3.5
C	'Agree'	4
C	'Strongly Agree'	5

7.3.3 Results of correlational analyses of personality scores and 'distance from A' scores

As a first stage in this set of analyses, the results of the earlier analyses shown in Tables 19-23 were used as the basis for deciding whether or not the personality scores of the traditional and PBL groups could be combined, and whether the personality scores of the male and female students within the traditional and PBL groups could be combined, for comparison with the students' 'distance from A' scores or measure of 'C-ness'. Where significant cohort or gender differences in any of the five personality dimensions had already been found, then analyses of the correlation between 'distance

from A' score and that particular personality dimension were carried out separately for the groups of students involved. The 'distance from A' score for each student that was used in the analyses was that derived from responses to the learning perceptions questionnaire that had been administered near the end of the first undergraduate year. Spearman's Rank-Order Test of correlation was used to analyse the data in each case. A summary of the results of the correlational analyses is shown in Table 24.

Table 24 Results of analyses of the correlations between 'distance from A' scores and personality scores: traditional and PBL students

Personality Factor	Student groups included in the analysis	Number of students included in the analysis	<i>Rho</i>	<i>p</i>
<i>Openness to experience</i>	All traditional and all PBL combined	164	0.32	0.00
<i>Agreeableness</i>	i) Male traditional	32	-0.06	0.76
	ii) Female traditional	40	0.36	0.02
	iii) All PBL	92	0.24	0.02
<i>Conscientiousness</i>	i) All traditional	72	0.11	0.36
	ii) All PBL	92	0.01	0.91
<i>Extraversion</i>	All traditional and all PBL combined	164	0.16	0.04
<i>Neuroticism</i>	i) All traditional	72	-0.20	0.10
	ii) Male PBL	32	0.02	0.90
	iii) Female PBL	60	-0.22	0.09

Note: 'All traditional' and 'All PBL' each included male and female students.

The corresponding scattergrams are shown in Figures 32-41.

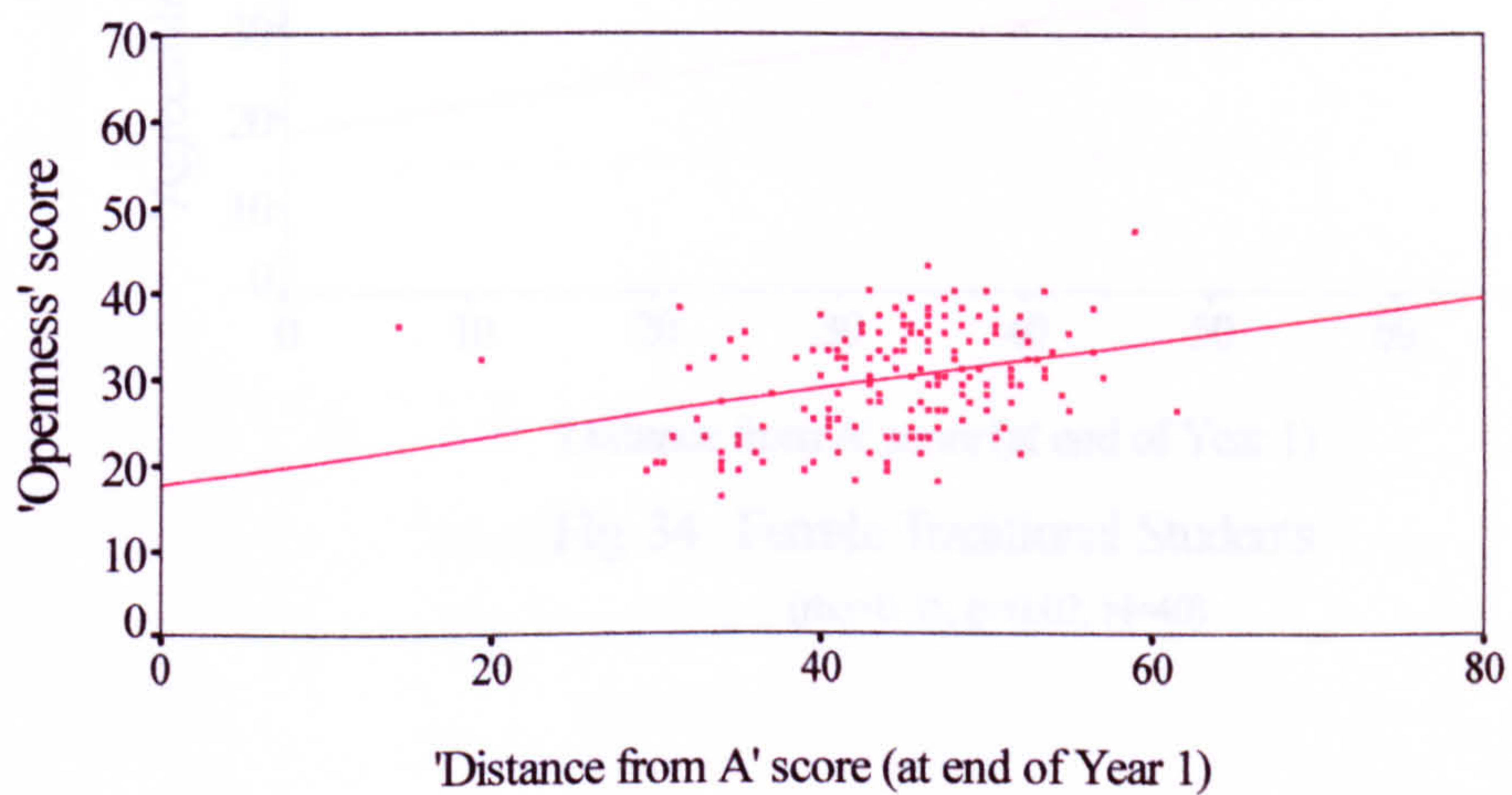


Fig. 32 All Traditional and PBL Students
(rho=0.32, p=0.00, N=164)

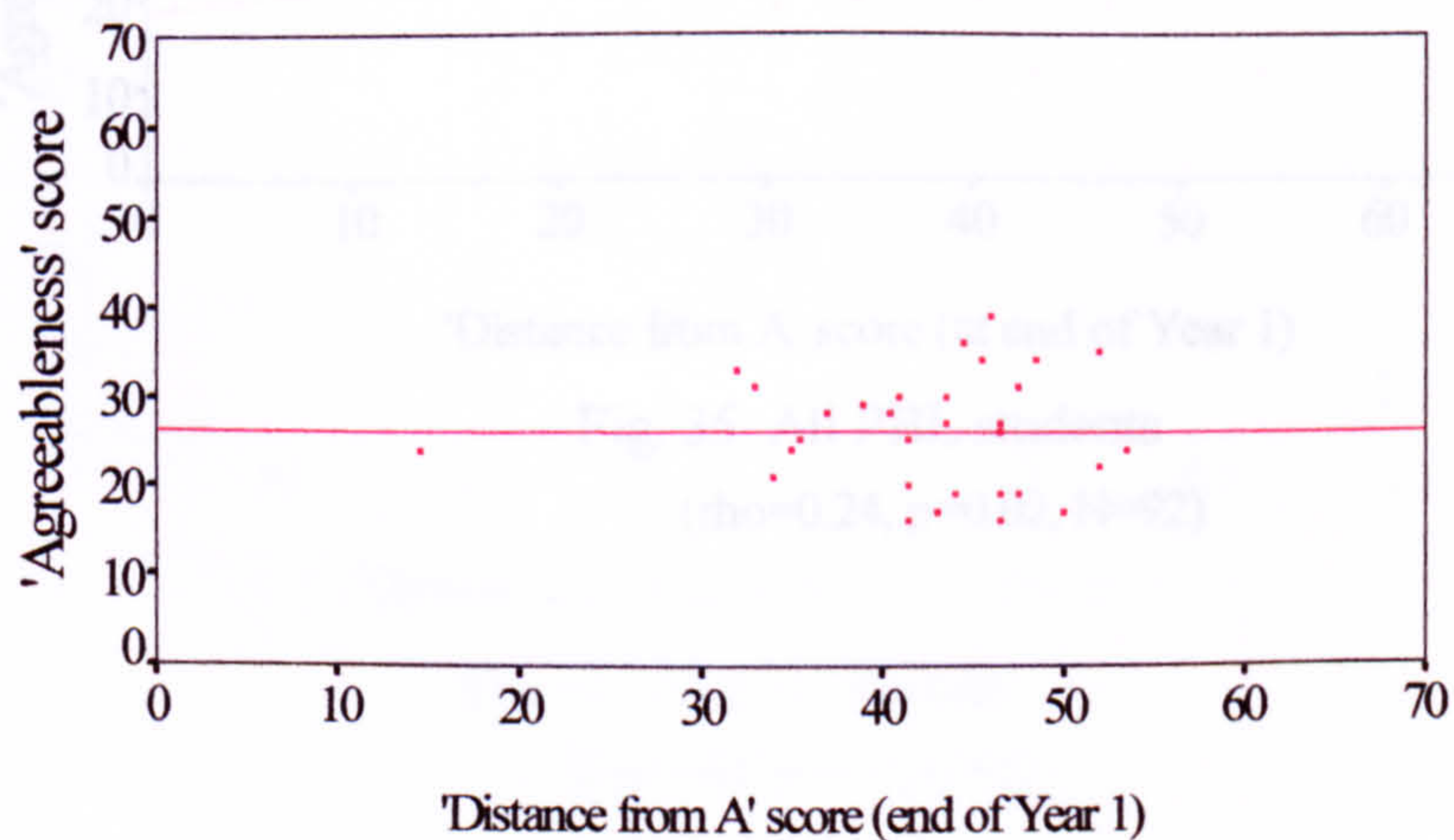


Fig. 33 Male Traditional Students
(rho=-0.06, p=0.76, N=32)

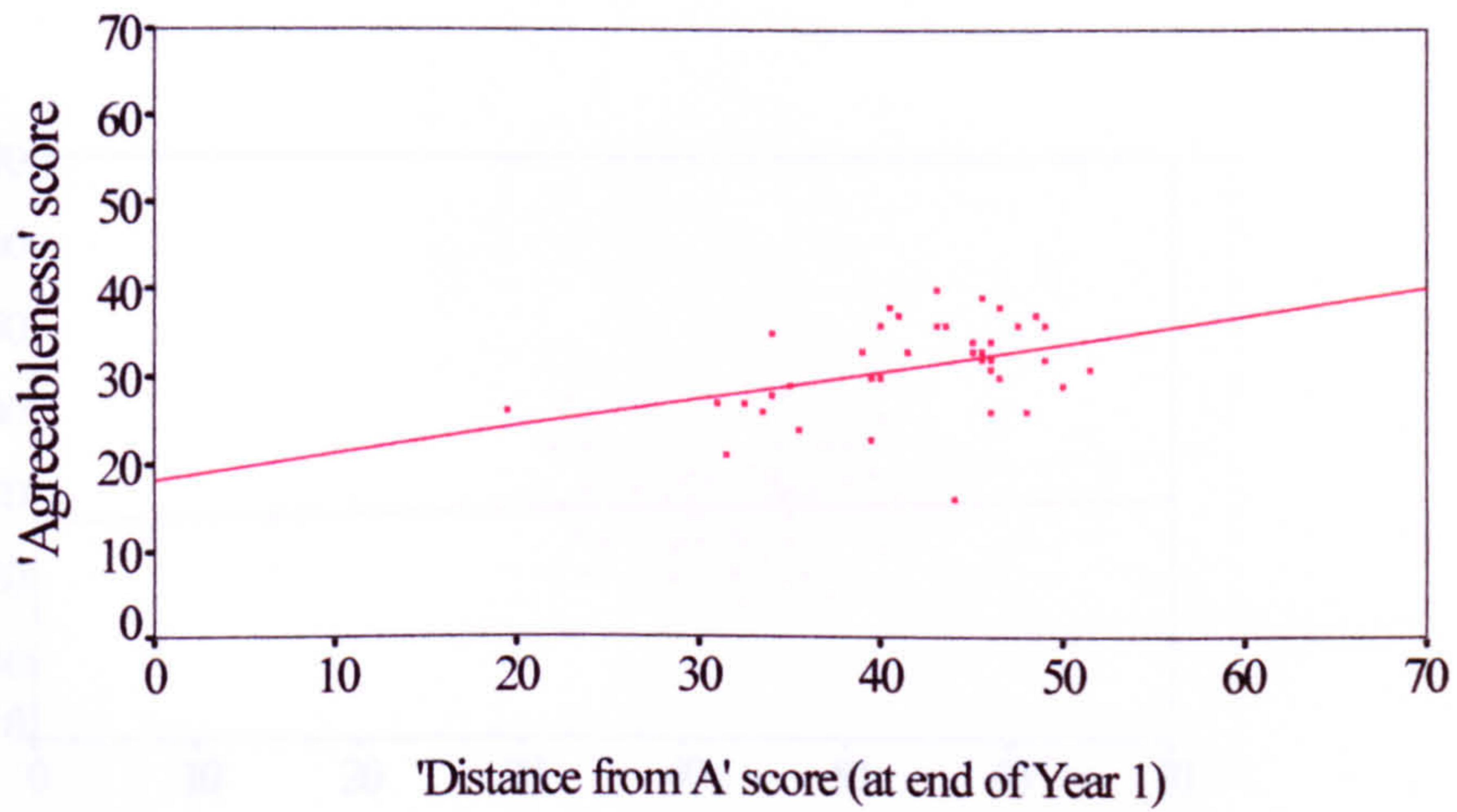


Fig. 34 Female Traditional Students

(rho=0.36, p=0.02, N=40)

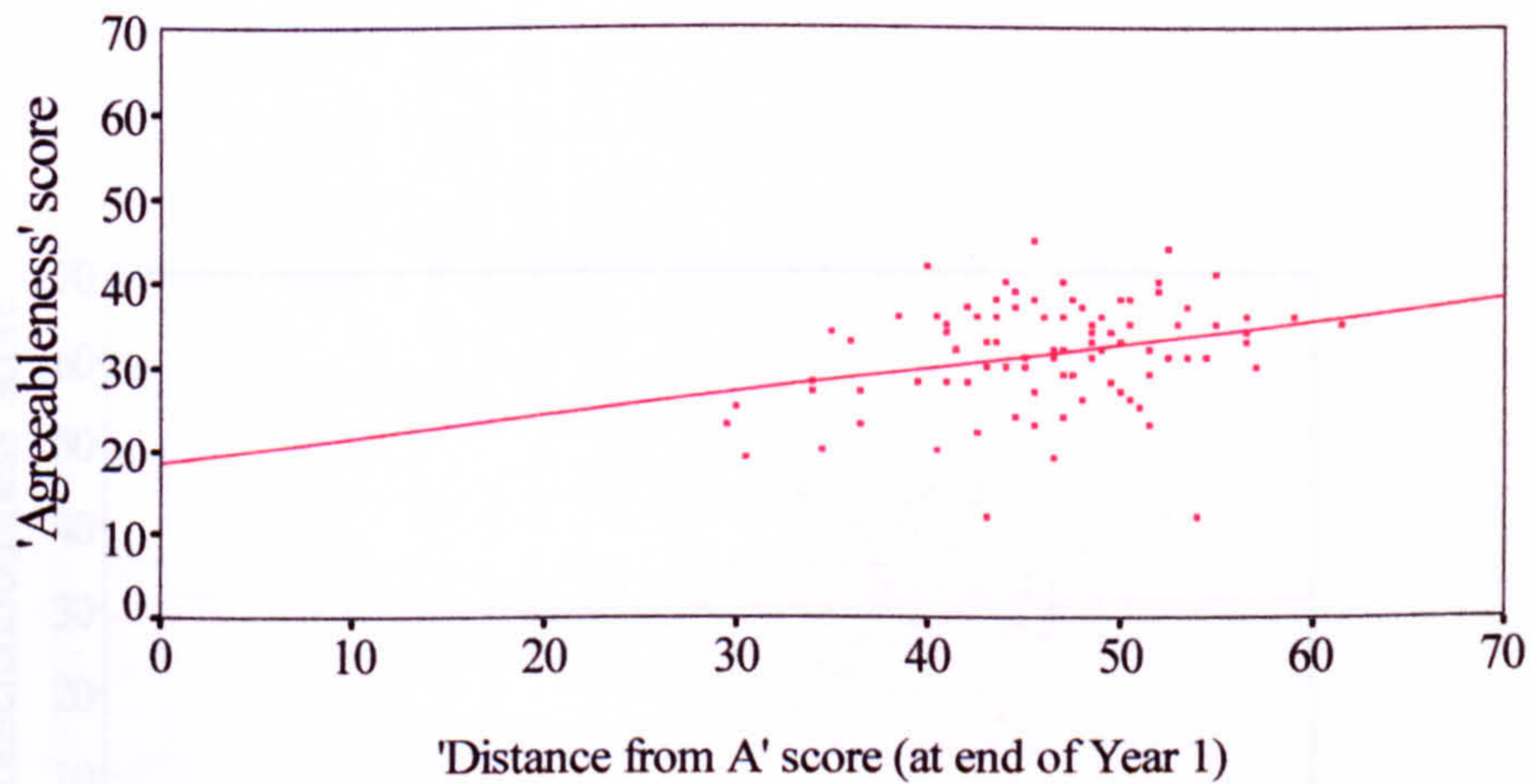
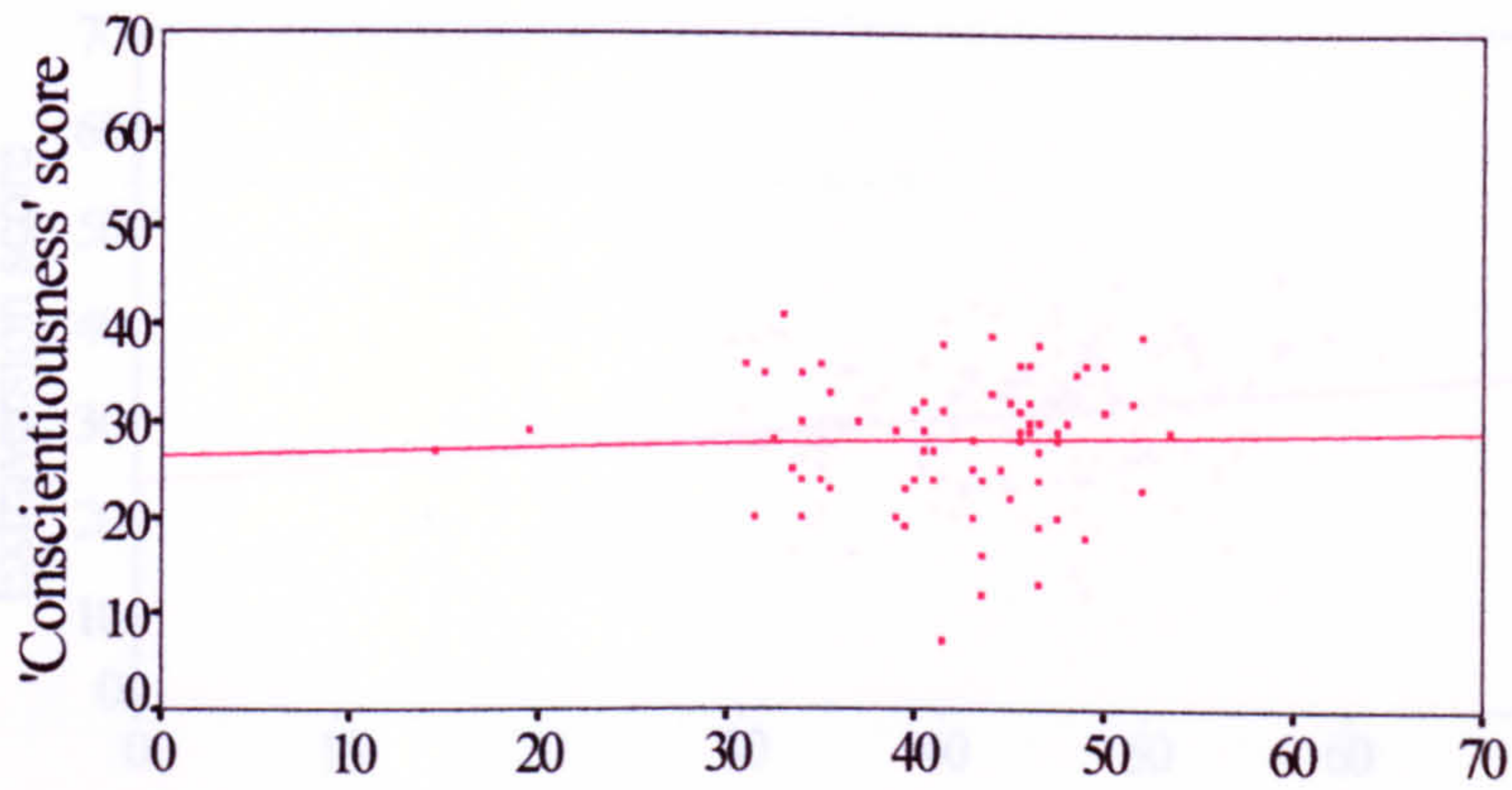


Fig. 35 All PBL students

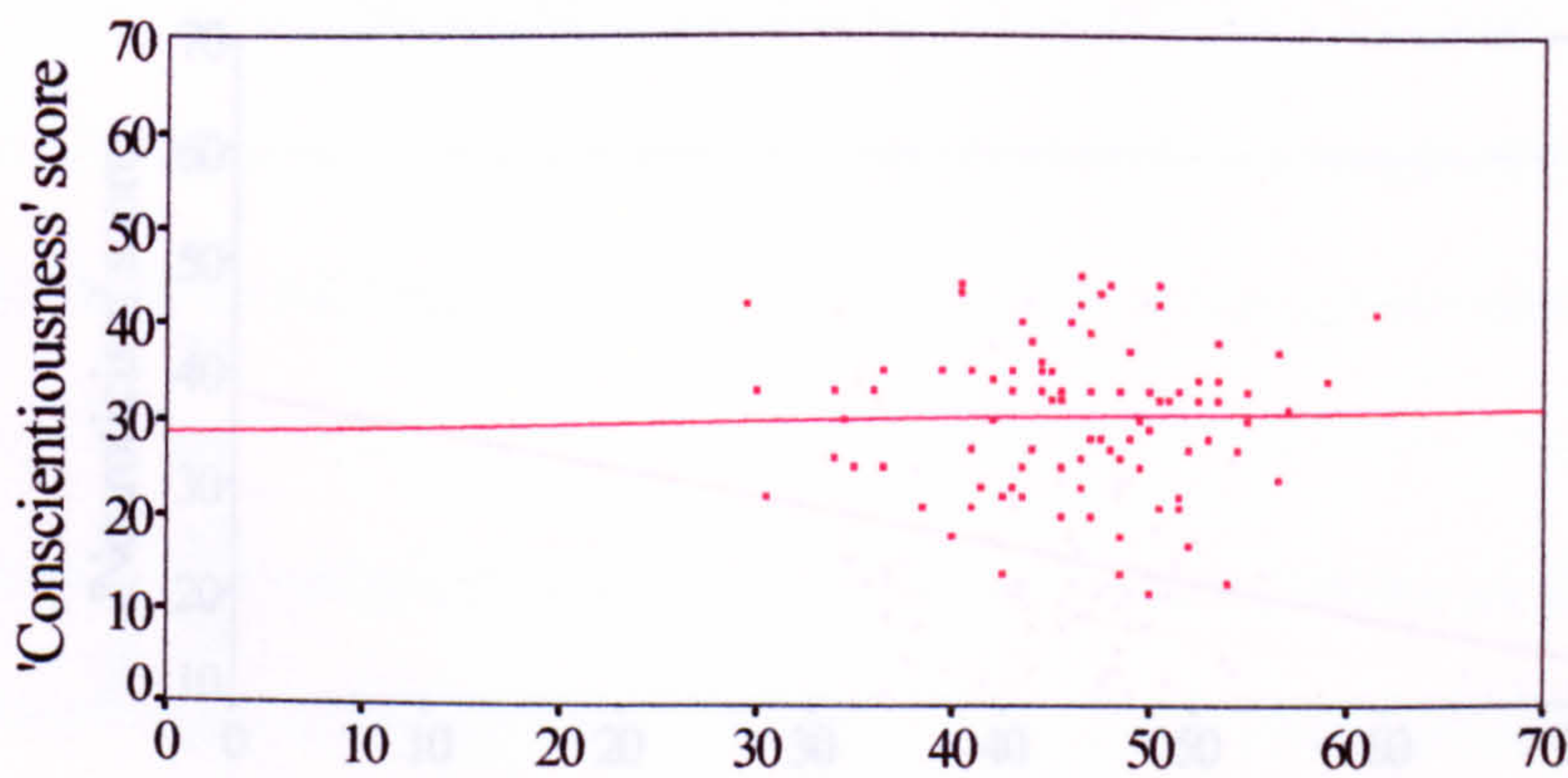
(rho=0.24, p=0.02, N=92)



'Distance from A' score (end of Year 1)

Fig 36 All Traditional Students

(rho=0.11, p=0.36, N=72)



'Distance from A' score (at end of Year 1)

Fig 37 All PBL Students

(rho=0.01, p=0.91, N=92)

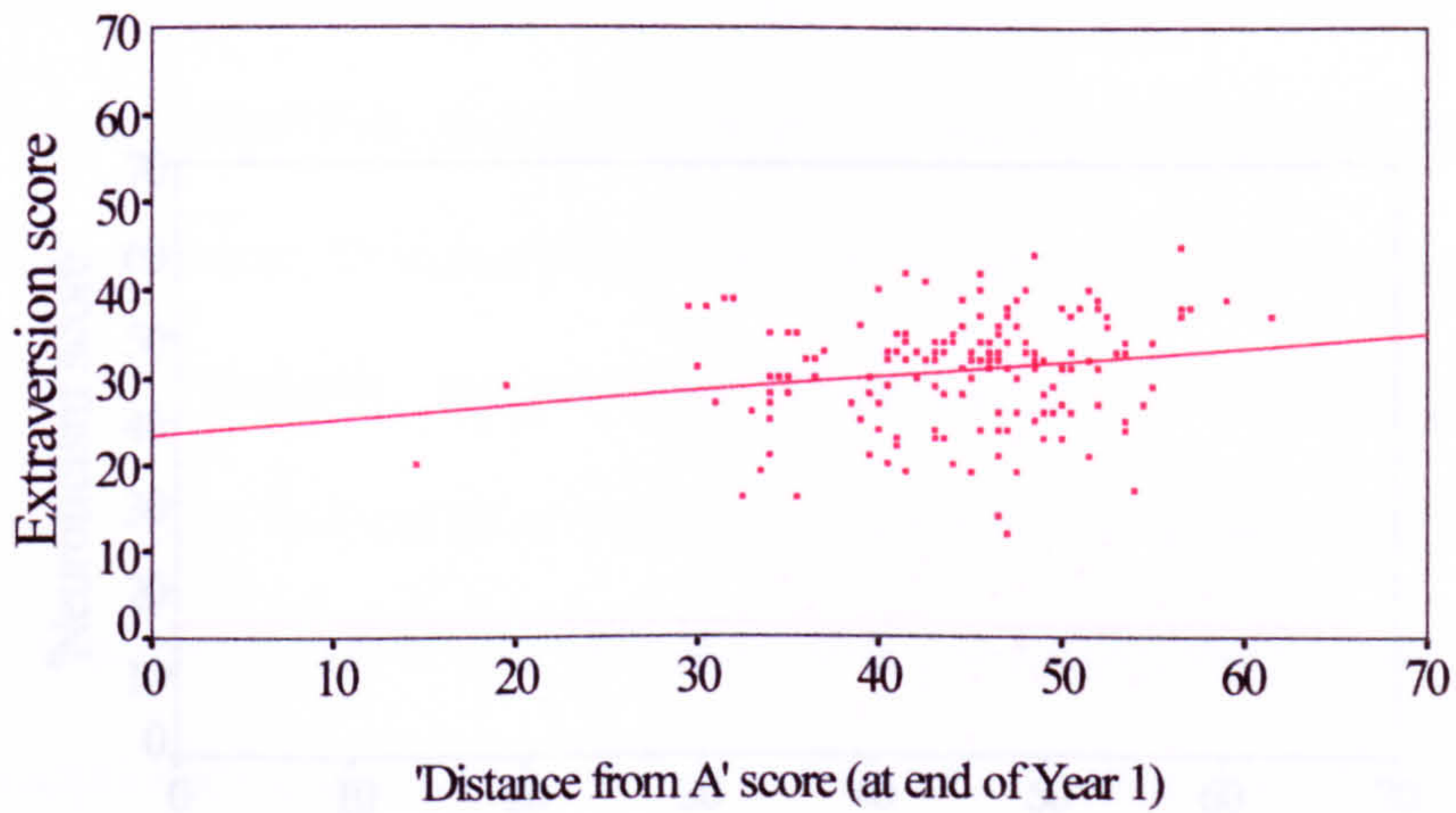


Fig. 38 All Traditional and PBL students
 ($\rho=0.16$, $p=0.04$, $N=164$)

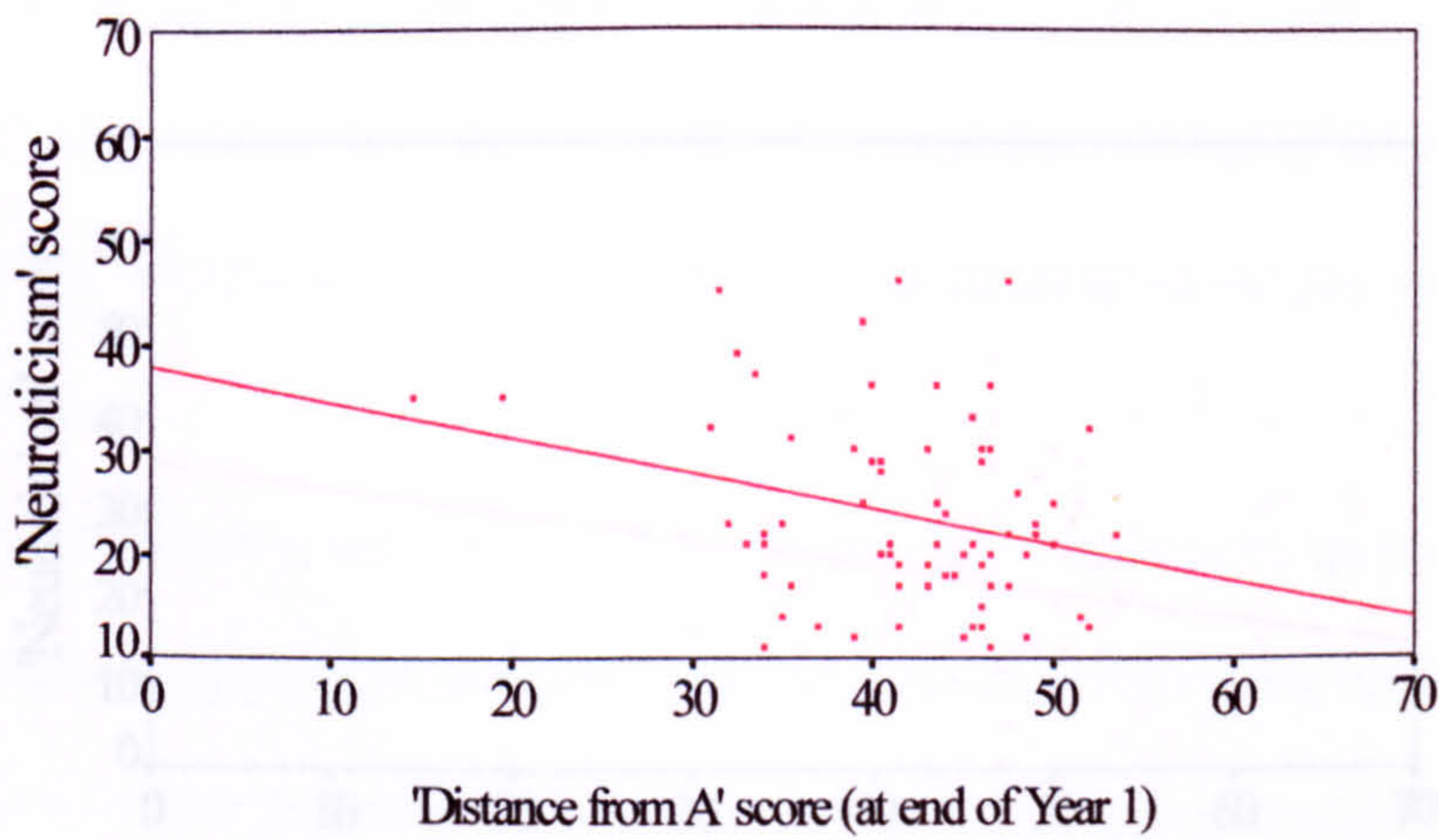


Fig. 39 All Traditional Students
 ($\rho=-0.20$, $p=0.10$, $N=72$)

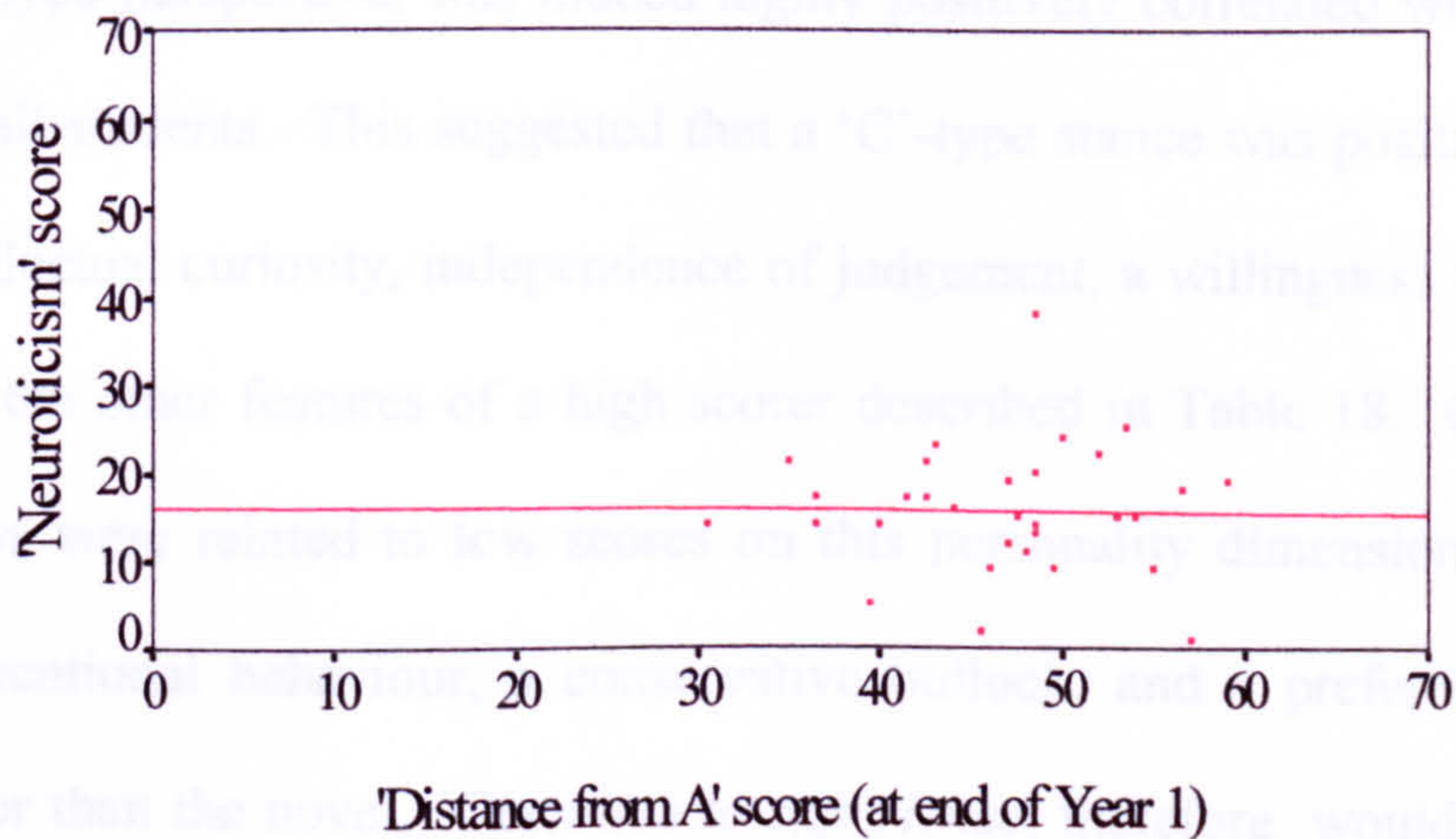


Fig 40 Male PBL Students
(rho=0.02, p=0.90, N=32)

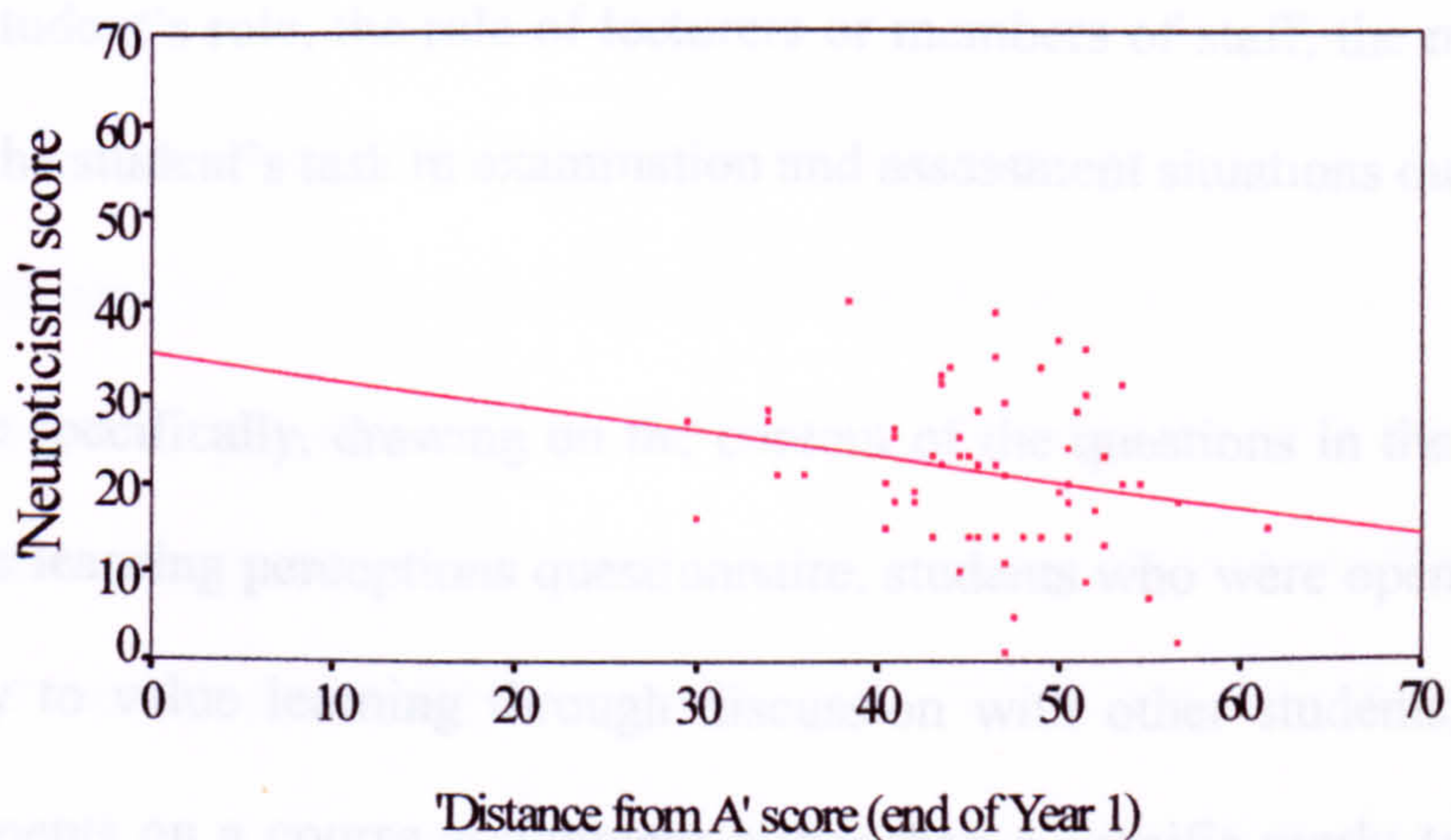


Fig 41 Female PBL Students
(rho=-0.22, p=0.09, N=60)

Most of the analyses yielded no significant associations at the 0.05 level between 'distance from A' and personality dimensions. However, *openness to experience*, the personality dimension that was thought to share characteristics with a learner with a 'C'-type perspective, was indeed highly positively correlated with 'distance from A' for all students. This suggested that a 'C'-type stance was positively associated with intellectual curiosity, independence of judgement, a willingness to question authority and the other features of a high scorer described in Table 18. Conversely, 'A'-type views were related to low scores on this personality dimension, in other words, to conventional behaviour, a conservative outlook, and a preference for the familiar rather than the novel. *Openness to experience*, therefore, would seem to provide an independent measure of the kind of characteristics that describe a student who has strongly 'C'-type views within Perry's scheme of cognitive development. The significant positive correlation between *openness to experience* and 'distance from A' also lends support to the general descriptions of 'A', 'B' and 'C' positions vis-à-vis the student's role, the role of lecturers or members of staff, the nature of knowledge, and the student's task in examination and assessment situations outlined in Table 1

More specifically, drawing on the content of the questions in the appropriate section of the learning perceptions questionnaire, students who were open to experience were likely to value learning through discussion with other students; to choose written comments on a course assignment rather than a specific mark; to enjoy undertaking learning tasks where the student has scope to decide what has to be done; to prefer

examinations/assessment situations which give an opportunity for the student to demonstrate independent thinking; and, lastly, to value the variety of opinions that results from a number of staff teaching a course. In contrast, students who were not open to experience were more likely to think it was the responsibility of members of staff to give them all the information that was required to pass the course; that there was little point in a course including topics that would not be assessed; that it was a waste of time to work on problems that had no possibility of having an unambiguous answer; that the only fair problems in a test were those that were exactly like those already encountered in the course; and that a good thing about medical sciences was that everything was clear-cut and unambiguous.

The second personality dimension which showed a significant positive correlation with 'distance from A' was *agreeableness*, although not for all students. The relationship was significant for all PBL students and female, but not male, students in the traditional course, demonstrating a link between 'C'-type perceptions of learning and altruism, sympathy for others, an eagerness to help others and a belief in the helpfulness of others. 'A'-type perceptions, on the other hand, were likely to be related to competitiveness, a scepticism about other people's intentions, egocentrism and antagonism. As noted earlier, higher scores for women than men are typically found on this personality dimension (see *NEO* test norms, Appendix 5) but, in the light of those features associated with higher scores, such as altruism and sympathy, it is interesting and encouraging to find a significant link between 'C'-ness and a high score on *agreeableness* in both male and female students in the group-orientated PBL curriculum.

Extraversion also demonstrated a significant positive correlation with 'distance from A' scores, in other words, a 'C' position *vis-à-vis* learning was associated with liking excitement and stimulation, being talkative, energetic and sociable. In contrast, 'A'-type views were related to being more introverted.

Finally, given the 'softness' of the data analysed, especially that from the learning perceptions questionnaire, it is worth mentioning two other results which reached the 0.1 level of significance. These results both concerned *neuroticism* and, unlike almost all the correlations in Table 24, were negative. For all the traditional students and women students in the PBL course, low scores on the *neuroticism* factor were associated with 'C-ness'.

7.4 Summary of findings about the students' personality scores

There was one significant gender difference in personality in each of the two cohorts of students, with women in the traditional course scoring more highly than their male colleagues on *agreeableness* while women in the PBL course were higher than men in *neuroticism*. It was noted that such gender differences in these two particular facets of personality were not unusual. With reference to the personality results for male and female students *across* the two undergraduate courses, the male students in the PBL course were significantly more *agreeable* than their male counterparts in the traditional course, while the latter were significantly more *neurotic* than the former.

As far as the female students were concerned, those in the PBL course were significantly more *conscientiousness* than those in the traditional course.

The necessity of deriving a single score for each student from the learning perceptions questionnaire raised methodological issues, focused mainly on the meaningfulness of a single 'score' calculated from qualitative data. These issues could not be resolved completely but they were taken into account in the formula that was eventually devised for the calculation of a single score of 'distance from A' for each student. When students' scores on each of the five personality dimensions were correlated with their 'distance from A' scores at the end of their first undergraduate year, the results were as follows.

A significant positive correlation was found between 'C'-ness and extraversion. No significant associations at the 0.05 level were found between end-of-year 'distance from A' scores and *conscientiousness* and *neuroticism* for any of the students. *Neuroticism* showed significant associations at the 0.1 level: for all traditional but only female PBL students, there was a negative correlation between 'C-ness' and *neuroticism*.

In the case of female students in the traditional course and both male and female students in the PBL course, there was a significant positive correlation between 'C-ness' and *agreeableness*. For male students in the traditional course, this relationship was not significant. However, of greatest interest was the finding that, for students in

both courses, there was a highly significant positive correlation between 'C'-type views (i.e., greater 'distance from A') and *openness to experience*. The features, therefore, which are thought to reflect *openness to experience* would seem to be similar to those put forward as characterising a 'C'-type stance in relation to the teaching and learning environment.

CHAPTER 8

ANALYSIS OF INTERVIEWS I

STUDENTS' MOTIVATION, CONFIDENCE OF SUCCESS AND PERCEPTIONS OF DIFFICULTIES IN UNDERGRADUATE STUDY

8.1 Introduction

The purpose of interviewing individually a small number of students from each of the two curricula was to provide an opportunity for putting some 'flesh on the bones' of the more quantitative data obtained from the self-report questionnaire about learning perceptions completed during the students' first undergraduate year. Also, since the interviews took place towards the end of the students' second undergraduate year, the students had had a longer period of study on which to reflect and so perhaps place their first year undergraduate experience in a wider perspective.

By means of the semi-structured interview schedule (Appendix 2.2), it was hoped to gather information, in particular, about concerns that had recurred in students' 'unstructured' comments in the sheet enclosed with the learning perceptions questionnaire administered at the end of first year. Such concerns focused on workload, levels of motivation and of confidence about passing at different stages of

the medical degree course, and approaches to studying at both school and university.

All interviewees agreed to the tape-recording of their interviews.

The results of the interviews are presented in two Chapters. The subsequent Chapter describes the extent to which the students judged their medical course in general to have reflected specific characteristics (for example, the learning of details, the understanding and application of principles, and thinking independently) that might be expected to differentiate between a problem-based learning curriculum and a more traditional, lecture-based one. The Chapter also reports the approaches to studying, especially in relation to exam revision, employed by students in both their school and university studies and describes the ways in which the interviewees accounted for the C→A or A→C shift during their first year in response to the sentence stem about exams/assessments in the learning perceptions questionnaire. This change in response from one extreme answer to the other was the basis on which questionnaire respondents were selected for interview (see Section 8.2).

The present Chapter focuses on the following: the extent to which students thought that their motivation to become doctors had changed during their first two undergraduate years; the extent to which they had been confident, at the beginning of the respective years, of passing first and second years and how confident they were of completing the medical degree course; those aspects of undergraduate study, if any, that they had found most difficult; and, lastly, their perceptions of the workload of the course.

8.2 Interview participants

A suitable criterion for selection of a group of interviewees had to be established. It was decided to focus on that aspect of the learning environment that had shown the largest difference between students in the two courses in terms of their responses to the learning perceptions questionnaire, namely, examinations. Students' responses to the fourth sentence stem (*'My job in assessments and exams is ...'*) were examined and those students who had demonstrated changes in their response from one extreme type to the other (i.e., A→C or C→A) during first year were identified and invited to an individual interview. The 'A' and 'C' type responses to the sentence stem were as follows:

'A': *'To give back the facts I have learned as accurately as possible. I prefer questions with single clear-cut answers rather than open long questions.'*

'C': *'To answer the questions, including what I have been taught and what I have found out for myself from reading or other sources. I dislike questions which force me into a fixed answer (such as multiple choice) and prefer open questions in which I have room to show my own thinking.'*

Twenty-five students in the traditional course and 20 students in the PBL course were identified as having changed their responses to this specific sentence stem from either

'A' to 'C' or 'C' to 'A' during first year . This group of 45 students was invited to be interviewed individually (see Appendix 2.1 for copy of invitation letter sent to these students). Table 25 shows in detail the responses to the request for an interview while Table 26 gives the numbers of students in each of the two courses who changed their responses to the sentence stem from A to C or from C to A.

Table 25 Outcome of invitations to students in the traditional and PBL courses to take part in individual interviews

Outcome of invitation to take part in interview	Students in traditional course	Students in PBL course
Agreed to be interviewed and interview carried out	11	8
Agreed to be interviewed but did not appear for interview	1	0
Refused interview – long-term illness	0	1
Refused interview	2	4
No response to request for interview	10	6
Letter returned by Post Office	1	1
<i>Total invited to take part in interviews</i>	25	20

Table 26 Number of students in the traditional and PBL courses who changed their responses during first year from A to C or from C to A and were invited for interview

(The numbers shown in brackets refer to those who actually attended for interview)

Nature of change during first year in response to 'exam' sentence stem	Students in traditional course		Students in PBL course		<i>Total</i>
	Male	Female	Male	Female	
A→C	5 (2)	5 (3)	5 (1)	11 (5)	26 (11)
C→A	5 (0)	10 (6)*	1 (0)	3 (2)	19 (8)
<i>Total</i>	10 (2)	15 (9)	6 (1)	14 (7)	45 (19)

* The analysis of the interview material is based on five, not six, interviews in this category because the tape-recording of the interview was faulty.

The proportion of students in each group who were invited to take part in an interview was low (by virtue of the specific responses to the fourth sentence stem) as was the number who actually attended: 0.4 of the potential interviewees in both the traditional group (n=11) and the PBL group (n=8). The figures shown in Table 26 suggested that, in terms of specific course (i.e., traditional *versus* PBL) and nature of the change

in response (i.e., $A \rightarrow C$ versus $C \rightarrow A$) during first year, the students who attended for interview were reasonably representative of all students who had been invited for interview. However, in both the traditional and PBL courses, three times as many women as men participated in the interviews. The low take-up rate generally, together with the under-representation of men in the group of interviewees, suggested that caution was necessary in the interpretation of the interview material, that is, that the interview responses could not be regarded as representative of all respondents to the learning perceptions questionnaire.

8.3 Levels of student motivation during the first two years of the medical course

Interviewees were asked a general question about whether they thought their motivation to become a doctor had changed during their course. As can be seen from the interview schedule (Appendix 2.2, Question 6), the question was left open-ended and did not define 'motivation', thus leaving it to the students themselves to interpret the term as referring to the strength of their desire to become a doctor, their reason(s) for wishing to qualify as a doctor or both. Most interviewees in both courses interpreted the question in terms of the strength of their wish to become doctors, although some in the PBL course and one or two in the traditional course did refer to their reasons, sometimes in other parts of the interview, and usually these reasons reflected a desire 'to help other people'.

8.3.1 Interviewees in the traditional course

In contrast with the PBL students (described below), about a half of the traditional interviewees thought their motivation had probably decreased at least a little during the course but the impression gained during their interviews was that this was almost to be expected during these two particular years of the medical course, namely, the non-clinical years – the ‘boring years’, as one student described them. The students’ expectations were that their motivation would increase once they were into their clinical work in the third year and, in this sense, their views here were similar to many of those in the PBL course below, that is, high motivation was recognised as being linked with contact with ‘real patients’. This was typified by the response from one student:

‘I would say it [motivation] reached quite a “low” earlier in the year ... just when you are snowed under, just so much work to do and no real end in sight, but I would say this term it’s picked up a bit because we’re starting to get a bit more patient contact, although I have my first patient contact at the end of this week. This is me in my second year and I had never seen a live patient! You can also see that third year, which is meant to be a good year, is in sight now.’

Two students thought their motivation had increased in varying degrees. The first, whose motivation had increased to a small extent, gave the reason mentioned above –

the prospect, albeit slightly daunting, of working in hospital in her third year – with the added comment that she would not have ‘looked forward to another lecture-based year.’ The second student was the only one in the traditional group who said that her motivation had become considerably stronger. Her enthusiasm was conveyed in the following statement:

‘I thought I’d get bored and I’m not, I’m getting more and more obsessive about it. I know exactly what I want to do at the end of the day. I know what career [in medicine] I want. I must bore people rigid because I feel I talk about it [medicine] non-stop.’

Another student interpreted the question about motivation almost entirely in terms of the particular sphere of medicine in which he thought he would practise, speculating that his choice was likely to change from his original idea of general practice to, possibly, psychiatry. He wanted to work in an area of medicine in which he could use skills of listening and talking to people and was certain that, given the nature of the pressures and responsibilities associated with a field such as surgery (‘it would be so easy to make a really, really important mistake ... to kill someone’), that kind of area would not be appropriate for him, career-wise.

Finally, one student gave an interesting response to the question when she described herself as having been more idealistic when she first came to the course, and she used the issue of abortion to illustrate her point:

'I have a lot of principles that I doubt I will be able to hold on to once I achieve my degree ... I'm a Christian and I feel strongly against things like abortion and things that involve life and death ... but I don't know if I will have the strength to be able to keep on saying "No" as each patient comes in and asks me to do this ... I expect that one day I might just compromise. But, when I first came in [to the course], I was so certain that I would never ever do that ... Now I still say I am against it but I know more about the arguments for abortion, so I can see why people would encourage it.'

8.3.2 Interviewees in the PBL course

Responses to the question about changes in motivation on the part of the interviewees in the PBL course were much less varied than those reported above. In contrast also, in the PBL course, none of the interviewees reported a lessening of the strength of their motivation to become doctors. As one commented: 'It sort of varies daily but it's never reached a point where I didn't want to do it.' Also, when one interviewee said that her motivation had not changed during her course, this lack of change reflected the continuation of an already high degree of motivation, as she stated: 'I'm still very keen and motivated.' Indeed, for almost all in the PBL course, their motivation to become doctors had increased (and, in one or two instances, substantially) from what were fairly high levels at the outset of their medical studies. Some students referred to the fact that their clinical experiences – visits to hospitals,

hospices, and GP's – had played a major role in their increased desire to become doctors. For instance, one said:

'You're more motivated because you see what you're actually going to be doing. I think before [in the traditional course] you were very detached in the first two years. It's keeping it really relevant, what we're doing, so that has increased motivation.'

The contact with patients, in particular, in the course of these clinical visits had had a major impact on at least one or two interviewees. For example, the student mentioned above who reported daily fluctuations in her motivational level had listened to one patient that morning, who:

'was just so fond of her doctor and appreciated him so much ... I will work like mad for five years to get the sort of affection from people that he got. It would be lovely to think that somebody thought so much of me the way she thought of him, so this morning I was thinking, "I'm going to do it, five years, I don't care, I'll do it." But then I never thought about not doing it.'

In the course of the interviews, the type of motivation, i.e., why the student wished to study medicine in the first place, as well as the strength of that motivation was often referred to briefly by the interviewees. As might be expected, the reason given was frequently the general one of wishing to work with and help other people in a

personal way. One interviewee, however, volunteered a quite different insight into the reason for studying medicine:

'I'm doing it more because I find the subject interesting rather than because I like people or touching patients; more because I find the ... theory ... interesting. It's quite good to work out the logic of things, where you've a problem to work out, but, as far as patients are concerned, I don't find that exciting.'

The nature of the response suggested that the student might have had clear views about preferred areas of medicine after graduation but a question about these produced an answer containing an unusual, possibly unrealistic, mixture of ideas:

'I'd like to do hospital doctor because I think you see better things there. Ideally, I'd like to do A & E because it is exciting but I'd still like to know I finish at a certain time. I don't want it to take over on the vocational side, I've still got other interests, and you can't keep these up if you're working 120 hours a week.'

Finally, one of the students who was very enthusiastic and whose motivation was extremely high felt that this was proving to be something of a disadvantage to her.

She said:

I want to be a doctor and I don't care how long it takes me to get there or how bad it is to get there, as long as I get there in the end ... One thing I love is the work. It might be hard – and it *is* very hard – but, because I have a lot of interests [in the subjects], it's a lot harder! I want to read everything – I can open up a book and I think, “Oh, that's quite good.” That makes it a lot harder to do certain aspects because, if I didn't enjoy it, I could just do no work and leave it and get on with my life. It sort of takes over.'

8.3.3 Others' views of the students' medical course: the reactions of other students and hospital medical staff to interviewees in the PBL course and to the course itself

One factor which might have had a powerful effect on students' levels of motivation was what other people, for example, medical staff in the hospitals they visited and other students, said to them about their views of the new PBL course. Perhaps not surprisingly, this was a topic that came up frequently in the interviews with the PBL students but not at all with those in the traditional course.

A few of the PBL interviewees mentioned the reactions of other students (often those with whom they were sharing flats, for example) to the new medical curriculum. These tended to be older students on the traditional medical course at Glasgow or students on similar courses, such as Dentistry. Generally, their comments about the PBL course were entirely negative, as the following comments from different students illustrated:

‘Every person I knew, from the first moment I started, because it was all so brand new, everyone I met in the old course said it was a Mickey Mouse type of course, you did no work, you weren’t going to learn anything, you would be useless doctors, and all sorts. Even my friends who are my age and went to other universities were going, “You just don’t do anything, do you?” ’

‘... a lot of people sort of challenge our course and say, “Oh, you don’t do enough Anatomy” or “You don’t know enough.” Every time they ask us something and we say, “Oh, we haven’t done this in our course”, they say, “What! You haven’t done it in your course? But we did it in first year!”

‘I think a lot of people sometimes think it’s a bit of a part-time course ... Even my friend, who’s a dentist, their course is much more like the old course, with all the Anatomy and 9 to 5 lectures every day – some of her friends come round and say, “Your medical

course is rubbish and you're not doing any work." ...if you don't know about it, it's very easy to look down upon it.'

It was clear that it was not easy for those PBL students who encountered this attitude to simply shrug off the comments:

'At the beginning, it was complete defensiveness – "Oh no, we do work as well, we'll be better than you." But, in the end, you couldn't really say whether you will or not, you don't know – you might be good, you might be bad – we're just doing it differently ... We're learning by completely different methods. We might have huge gaps in our knowledge (gaps which they haven't got) and we know how to deal with patients, and they don't have a clue, so ...'

'Eventually I said [to friends], "Oh, stop slagging our course!", so they've stopped talking about it now.'

In terms of the reactions of hospital medical staff to the interviewees as members of the new medical course, most interviewees had experienced 'diverse' responses:

'Some of the consultants, they have you all lined up and they're firing the questions and people don't know, and they'll say, "Why

don't you know?" And we'll say, "We've not been taught, we've not done that PBL." They'll say, "Why not?" and that's a concern. Others are quite good and they'll sit and explain to you, and that's great, but it shows you there could be a problem there. And certainly from the older students, you get, "They're only in first year, why do they get to do that? They shouldn't be doing that." Some people have been really good, and they've been positive and helpful ... but there have been the occasional ones who've been a bit dubious about the whole thing.'

'A consultant said this year... there was a difference – he's got a group of eight to take around the wards – there's a huge difference in our group of eight compared with the third years he's teaching from the old course, not just the hard sort of knowledge but our sort of attitude. The first day he said, "I wouldn't have had a group of third years sitting around here, chatting away to me over a cup of coffee. They wouldn't talk to me. You're all so much more comfortable, you sit there and you just tell me exactly what you think." He thinks that's a huge difference and it's much better.'

The student said that this particular consultant was a facilitator in the PBL course and 'very much into the new course'. In contrast, she thought that:

'... other professionals' attitudes are against it, some people have their problems with it. Some of the consultants say, "You haven't done this" and "You haven't done that."

Another student, having described the range of opinions more briefly, set the balance in favour of the new course:

'Some of them seem quite sceptical about it. You get so many jokes about it – "Oh, you're on the new course. Are you doing any work?" – that sort of thing. You get so many like that but I think I'd say that most people are really positive towards it. Because there really have been a lot of feelings about the way it has gone in the past, I think it's going to be for the better. I think a lot of people think positively about it.'

One student also talked of reactions she had experienced during her hospital visits but, in addition, observed that such comments were likely to affect individual students differently:

'Some doctors ... are not very enthusiastic about it and go, "Oh, yes, second year. I don't know how much you know about it. Well, anyway, I'm just taking you around." The way they say it, it's as if they're not very confident about this course. Then they're asking

questions, and you say you're second year and you don't know because you haven't done it, and they'll say, "But all second years did it before." It sort of puts you down and it depends on how you take it because some people will just be so discouraged but others will think, "I'll prove to you it works!"

Indeed, it seemed that most of the interviewees had adopted the latter attitude and described a positive approach to the new course, one or two taking the responsibility for ensuring the success of the course to be theirs:

'It's up to me to become the doctor I want to be and not really the course's fault ...I keep trying to tell myself that, yes, this new course is going to work because, if I don't give myself a chance to say, "This is going to be successful", then there is no point being in the course because I feel I should put in the work to make it a success. Eventually, I hope that we shall achieve the same thing, we learn the same stuff, we're equally good doctors when we come out.'

'... a friend said it quite well when she said, "But this is our life, and we're taking a chance on a new course. For us to put it down ... we're not going to benefit from it, with a completely negative attitude about it.'

Even though a student had chosen to apply for Glasgow specifically because the course was being changed, she had had doubts about the course at the beginning of her studies but clearly, by the end of her second year, she had been ‘won over’ to it:

At first, I was really sceptical. When I first came in, I thought, “This is never going to work, I really don’t think so.” But ... I’m really for it now, I think it’s a really good idea ... I think it’s got a lot going for it.’

8.3.4 Summary of students’ perceptions of changes in motivation during their first two undergraduate years

Some interviewees, in different sections of the interview, volunteered information about their main reason for entering medicine, which, in almost all cases, was ‘to help other people’. However, in response to the specific question about whether they thought their motivation to become a doctor had changed during their first two undergraduate years, most interpreted the question in terms of the intensity of their wish to become a doctor.

Differences between interviewees in the traditional and PBL courses were discernible in terms of their initial motivational level and the extent to which that had increased or decreased. In the case of the traditional interviewees, although a small minority

reported some increase in motivation over the two years of study, about a half thought their motivation had decreased to varying degrees and indeed seemed not to be surprised that this had happened, associating it with the pre-clinical years of their medical course and anticipating that it would rise again in their first clinical year. One or two interviewees gave quite individual responses to the question about motivation, referring not to motivational level in general but to changes in their plans for future medical specialty or to a deeper understanding of controversial issues on which they held strong ethical positions.

In contrast with the traditional interviewees, those in the PBL course reported a narrower range of responses to the question about changes in motivation. Almost all thought that their motivation had increased from already high levels at the beginning of their university course. What was common to both sets of interviewees was that they related a high level of motivation to clinical experiences and especially patient contact, thus accounting for the anticipated increased level in third year on the part of the traditional students and the increasing level in second year on the part of the PBL students.

Lastly, the PBL students, as discussed in Section 8.3.3, had encountered a variety of views about their medical course. These ranged from entirely negative ones from other students in related courses to mixed reactions (for example, favourable, hostile, or sceptical) from hospital staff they had met in the course of visits. Despite these – or, in some cases, because of these – most of the PBL interviewees were positive

about their course by the middle-end of their second year, even those one or two who had had reservations about it when they began the course in first year.

8.4 Initial reactions of the PBL interviewees to the experience of problem-based learning

8.4.1 Awareness of changes in the undergraduate medical course

The extent of prior knowledge amongst the interviewees about what exactly they would face as learners in a problem-based curriculum varied considerably. At one extreme were one or two students who, being aware that changes in the training of medical undergraduates had been proposed at national level and that Glasgow had responded by introducing changes in its course, had consciously chosen Glasgow for that reason, while still not appreciating fully what was entailed in 'PBL'. At the other extreme were one or two students who had apparently started the course unaware that there had been such dramatic changes and had been unprepared for their first few weeks. One student, for example, had been unable to obtain an up-to-date prospectus and was working from the one for the previous year, which had been for the last entry to the traditional curriculum.

Most interviewees were to be found between the two extremes, that is, they knew that the course at Glasgow had been changed in some ways but were vague about what

these changes were. With the exception of the one or two mentioned above who were unprepared for any changes, most interviewees had assumed that the changes would mean reduced time spent in lectures and more in tutorial work but were not prepared for the extent of these alterations in the balance of learning activities that they experienced when they began their PBL course. Regardless of the amount of pre-course information that the students had, the following was a typical comment about first reactions to the structure of the PBL course:

‘All I knew was that we were going to have clinical experience early on, they were trying to get away from lectures and we’d be doing work in groups but I didn’t realise that the whole thing, all our main learning, was going to be done in groups, so it was a big surprise. It was quite surreal at first. We got our timetables and we thought, “*Where are all the lectures?*”

8.4.2 Responses to the PBL group experience

Many remarked on how their experience of PBL had been directly related to the composition and functioning of the different groups in which they had participated during the two years, some making special mention of their first group experience in the course. One student had thought that he would find sitting in lectures too boring and, remembering his enjoyment of group work at school, had been looking forward to ‘group work’ in the new course. He recalled:

But the first group we went into was hellish, I just hated it – everyone just sitting there so serious and arguing, just different from anything I'd found before. It's good if you get a good group but there's not always a chance of getting that, you always get a few people you don't like.'

One student had also not enjoyed her first PBL group but went on to say that she had learned to accept features of this way of working:

'When I first started, I was totally overwhelmed when I went into my first PBL group because we had someone who already had a degree in Biochemistry and he knew *loads* of things ... Me and a few of the other girls just used to think at the beginning, "This is awful." It's getting used to the whole way that PBL works, that was my problem. It's very, very daunting. I used to go home and say, "Well, how much detail do they want?" I used to come home after getting our feedback and I'd have all this stuff I still had to look at, plus the next one, and I used to think, "This is an absolute nightmare." There were times in the first term it would get quite frustrating but that's fine, you learn to accept that and you think, well, you are going to be able to do this.'

Another also pointed to both negative and positive features of the PBL experience and then added other benefits:

'Every time we changed groups, I found it quite difficult as I am quite a shy person, so the first time ... I thought, "Oh no, what have I let myself in for?" Every group is different ... I got into a good group and didn't want to change ... This group was brilliant, I had such a good time and got so much done, everything just clicked really well ... I have met loads of people this year that I probably would have seen but never talked to last year ... I have made a few really good friends this year, I just couldn't believe I had never met up with them last year ...'

One or two others, by second year, were describing a slightly weary reaction to 'groups':

'Sometimes you go, "Oh, I can't be bothered getting into wee groups again and introducing myself." You have to go round everyone each time and say, "My name's _____" and all this, you know, and you just get a bit fed up with it!'

8.4.3 Summary of students' initial reactions to the PBL experience

The PBL interviewees varied considerably in the extent of their prior knowledge of the changes that had been implemented in the first year of the course for which they had been accepted. Most of them knew that Glasgow's undergraduate medical course had been changed but almost all, it seemed, had anticipated a less radical change. They had expected clinical experience at an earlier stage than in the traditional course but, although they had expected fewer lectures, they had expected that lectures would remain a fairly major part of the course and that the increase in group work activities would be of the more traditional tutorial or discussion type. By the time the interviews were conducted, i.e., at the middle-end of their second year, the students were clearly more accustomed to the PBL approach. Many, however, commented on the range of positive and negative experiences they had had in the PBL groups since beginning first year, referring to 'good' and 'bad' groups, but for almost all interviewees the first PBL group experience seemed to have been especially memorable for a variety of reasons.

8.5 Students' levels of confidence in passing at different stages of their medical course

The interviewees in the two courses were asked, firstly, if they could look back and recall how confident they had felt about passing the year ahead at the beginning of their first and second years and, secondly, to look forward and gauge their level of

confidence that they would complete the medical course.

8.5.1 Confidence levels at the beginning of first and second years: students in the traditional course

Amongst those in the traditional course, one or two found it difficult to remember sufficiently clearly in order to gauge their confidence accurately at the beginning of first year but most were confident in varying degrees that they would pass first year, with a few saying that they had been 'blindly confident' or that their confidence had been 'incredibly high'. Reasons given for their confidence at that early stage included their previous academic performance at school or college, where most had been accustomed to passing well, and the view that, given the highly competitive nature of admission to medicine, the fact that they had succeeded in being admitted should indicate that they were considered able to pass subsequently. In particular, those who had studied 'A' levels prior to entry reported that they had found that these overlapped their first year studies. One of the few students whose confidence had been 'shaky' at the outset overcame this quickly:

'I was a bit scared before I started lectures ... I came in and everyone was saying medicine was going to be really hard ... The first term was straight out of my 'A' levels. It was a great advantage over Highers, having done 'A' levels, I found ... So, for the first time ever, I did not have to study for an exam and I got a straight 'A'!

That was the first exam I did in medical school and I did well, so I thought it would be OK.'

At the beginning of their second year, almost all of the interviewees in the traditional course were reasonably confident of passing that year. Despite the expectation, realised in most instances, that second year would be a 'hard year' with an increased workload, they felt that, in comparison with the beginning of first year, their confidence was founded on a much more realistic view of what they would have to do in the months ahead. In addition, a few thought of it not so much in terms of 'confidence' but of a logical process whereby they would pass the course if they did the necessary studying, and would also reap other associated rewards!

'Basically, I think if you do the work ... You just have to make sure you do enough work, and I am confident that I can do that. I quite look forward to wearing the white coat next year and to wearing my stethoscope, so that's why I want to pass!'

8.5.2 Confidence levels at the beginning of first and second years: students in the PBL course

It seemed that, for the interviewees in the PBL course, the overall level of confidence

was not quite as high at the beginning of first year as that reported by the traditional interviewees. Only one student reported feeling very positive about the year ahead and a couple of students did not know how they had felt at that stage. Although the remainder thought that they would pass first year, again often on the strength of their experience at school, in comparison with those in the traditional course, they tended to qualify this in various ways. For example, they might have been confident of passing but 'not of passing well'; the confidence had been there at the beginning of the year but had dipped down at Easter as exams approached, compounded with uncertainties about the precise nature of the exams in this new course; and one student had been 'hopeful of passing' since she had worked hard but she was aware of the step up from study at CSYS (Certificate of Sixth Year Studies) level.

Their views about their confidence levels at the beginning of their second year also showed rather more diversity than those of the traditional interviewees. About half had continued to be fairly confident that they would pass. They thought this was because they had a more realistic view of the course, of the amount of work required, and because they were 'going in on the back of' confidence gained during first year with the increased familiarity with PBL. One said, in referring to this last point:

Once you've got the one year done, you feel a bit more confident about it, also probably a lot more about PBL ... and everything working. In first year, in first term especially, you spend the whole time wondering, "Am I doing enough? Are we going into enough

depth?” All these questions would come up in the question-and-answer sessions: “Are we doing the right thing?” That was always the worry and then at the end of the year you probably are doing the right stuff to answer the exam. This year it hasn’t come up at all.’

In the case of the remaining interviewees, confidence seemed to have decreased to some extent, especially after the beginning of second year, and this tended to be linked with worries about the volume of work facing them for the end-of-year exams and also concern about the timing of these – at the end of June – which seemed a long period during which the impetus to study would need to be maintained. One student, in contrasting course content in first and second years, mentioned a different, though possibly related, reason for her lessened confidence in second year:

‘I think it [the course] is much more this year – there’s a lot of understanding and application of knowledge, deeper stuff, not just surface stuff.’

8.5.3 Confidence levels in relation to completion of the medical course: students in both the traditional and PBL courses

Finally, compared with confidence levels at these early stages of their course, confidence about completion of the medical course seemed much higher in both groups of interviewees. All but one of the traditional interviewees thought that they

would complete the medical course, although one was more cautious than her colleagues:

'I'm not confident. I know I will get there but I'm sure I will fail at some point, I'm bound to, but I also feel that it will make me better, but that's just psychological for me.'

The one exception in the traditional course was considering, as a possible alternative, the intercalated science degree to pursue her interest in Immunology. Students who do well in the first two years of the medical course may be invited to study for a Bachelor of Science degree in the Faculty of Science for a period of one (Ordinary degree) or two (Honours degree) years. The intercalated degree enables students to study in greater depth than is possible in the normal medical course subjects from a range in the basic sciences, including, for example, Anatomy, Biochemistry, Pharmacology. After completing the intercalated degree, students can resume their medical course.

Likewise, almost all the students in the PBL course were confident that they would complete their course, although as one student said, she

'tended not to think about that. I just tend to think about what I've got to do at the moment. I think it's because they say they've not written the course really, you know, you've not got a lot to look forward to!'

8.5.4 Summary of students' reported levels of confidence in relation to different stages of the medical course

On the whole, those in the traditional course were reasonably confident, two or three extremely confident, at the beginning of the first year that they would pass that year. Previous educational attainments, especially in the case of those students who had completed 'A' levels, and the fact that they had succeeded against considerable competition in being admitted to the medical course provided the sources of this level of confidence. Despite the expectation – and the reality – of a difficult second year, again most were fairly confident of passing their second year, this time based, they felt, more firmly on the experience of their first year of study.

In contrast, for the PBL interviewees, confidence levels seemed less consistent over the two years, with the overall level of confidence at the beginning of first year possibly being a little lower than for the traditional interviewees. About half had thought they would pass first year, again on the basis of their school or college experience, but statements of confidence in passing were rarely unqualified. The reports about confidence levels at the beginning of second year were also more varied – as for first year, about a half continued to be quite confident about passing their second year but others reported their confidence falling after the beginning of second year, decreases in confidence often linked to forthcoming end-of-year exams.

Lastly, although one or two interviewees in both courses felt that their final year was

very distant and rarely thought about it, for most interviewees in the two courses, confidence about completing the medical course was high.

8.6 Those aspects of undergraduate study considered the most difficult

Throughout the interview, students in both courses often referred to sources of difficulty as part of their response to other interview questions, some of which are discussed in some detail in other sections of this and the subsequent Chapter (e.g., the volume of the workload, approaches to studying). For this reason, what is presented in this Section is a summary of the interviewees' responses to the specific question in the interview about difficulties they had experienced.

Interviewees in the two courses were asked what, if anything, they had found to be the most difficult aspect of undergraduate study. Generally the question produced the kinds of responses that might be expected from many undergraduates, regardless of the type of curriculum in which they were studying.

Those areas mentioned by most of the PBL students could be categorised into two sets of factors. One set was associated with volume of work (e.g., searching out and obtaining the relevant material from the different sources), time management (e.g., 'getting bogged down in PBL's and letting other things fall away') and self-discipline ('making myself sit down and read things when I *have to*'). The other set of factors

was concerned with 'knowing what you're being expected to do' in terms of selection of the 'important' areas for studying and the gauging of the appropriate depth of knowledge required of them in such areas (e.g., 'where to stop in a particular topic'). One or two interviewees thought that more exams would be useful for providing students with feedback on their progress, especially in preparation for end-of-year professional exams, while a number thought there was value in including more lectures in the PBL curriculum to provide a summarising function. For instance, one student said of lectures:

'Sometimes I think lectures are quite good in their way because they give an overview or the structure of what you're supposed to be learning whereas you don't get that [in PBL].'

Those aspects of undergraduate study reported as 'difficult' by the traditional interviewees could not be categorised so readily into sets of factors but there was still some overlap with the kinds of aspects mentioned by the PBL interviewees. A few students, for example, also selected the volume of the workload, in addition, highlighting in the traditional course the pressure from exams ('you feel you are never away from them') together with the lack of available exam revision time between the end of teaching and the beginning of exams. Another area of overlap was the amount of reading around subjects which was required.

Other features mentioned by individual students in the traditional course included the problem of studying (also related to the heavy workload) in shared student flat accommodation, especially if flatmates were studying in 'non-medical' courses that finished earlier in the academic session. Also, expectations of students' families were a source of pressure, in particular, parents who had made financial sacrifices to enable their son/daughter to pursue a medical course. Lastly, one student talked emotionally and at length about the aspect she had found the most difficult with which to cope. She had been ill at the time of the professional exams in first year and had had a resit. She discovered that she had to cope not only with her own strong feeling of failure but also the destructive attitude on the part of some other students:

'Failure, I would say, has been the most difficult thing to deal with because it is such a confidence destroyer, it really is the worst thing. There is certainly a big stigma about it ... and there are some people who are quite nasty. Only yesterday, two of us in my dissection group who had a resit in the same subject had a big fight with one of the others in the group, who said that you'd have to be incredibly stupid to have one ... If he does badly in an exam, he'll say that the exam must have been a bit odd "because thick people beat him" ... The arrogance of some of the medical students is absolutely unbelievable ... they can make you feel an even bigger failure.'

8.7 Students' perceptions of volume of work in their medical courses

The first questions in the interview (Appendix 2.2, Questions 1a and 1b) asked students how they had found the workload in their course and whether they had anticipated the volume of work that they had actually encountered. Interviewees in both courses had anticipated that their medical course would involve a very heavy workload. This expectation was generally based on a number of sources of information – formal information about the course from the university and from school teachers, and feedback from family and friends who were currently medical students or practising medicine.

However, despite this similarity in expectation about extent of the workload, the two groups of interviewees differed in their actual experiences of the workload. Interview questions about the volume of work in their medical course produced more homogeneous answers from the interviewees in the PBL course while those from the traditional course were more varied.

8.7.1 Perceptions of volume of work: students in the PBL course

Generally, amongst the PBL students, there was a consensus that the workload they had experienced in first year had been much lighter than they had anticipated but that there had been quite a marked increase in second year. Some students attributed this

perceived difference to an ignorance on their part during first year about *how* they were supposed to work in a problem-based course and that possibly they had not been working as hard as they should have been. One student, for example, said:

‘I know there’s more work [in second year], and everyone’s saying it’s a lot more to juggle this year, but I’m definitely making myself work a lot harder as well.’

Many interviewees in the PBL course had wished for greater guidance from staff about what was expected of students in the new course, especially in terms of the appropriate depth of knowledge of topics that students were required to have. One student, who had voiced a number of concerns she had about the PBL course, gave ‘a few extreme examples’ of her lack of success in getting answers to what she felt were legitimate enquiries:

‘It’s hard, very hard for us to raise problems with staff. You get a lot of, “I’m not meant to answer you” or “No, we don’t talk about that” and often the PBL tutor doesn’t know *anything* about what we’re studying, and they openly admit that – “We don’t do that, we do something else”, Sociology maybe. You’re sitting there thinking, “This is not helpful.” ... Where you’ve studied hard, you are stuck and you try to raise the problem, these kinds of comments back, it really puts you off being there.’

Other students who had completed 'A' levels in the year prior to admission to medicine felt they had been able to draw heavily on their 'A' level material in first year but in contrast in second year they had been faced with more material that was completely new to them.

8.7.2 Perceptions of volume of work: students in the traditional course

Interviewees in the traditional course voiced more diverse views about workload. These included students who, although they had anticipated a heavy workload and considered this was to be expected in a medical course, clearly found the volume of work almost overwhelming:

'horrendous ... I knew it was going to be hard ... I don't think so much is difficult at the moment rather that there's such a lot you have to know.'

'it's phenomenal ... I always knew there would be a lot but the amount there is is absolutely unbelievable.'

'it just feels that every time you finish something, there's another huge topic, another big burden on your workload, coming up – the last two weeks before exams especially, they can be complete nightmares, trying to get everything put together'.

Others accepted that the workload was heavy but demonstrated a specific attitude to it or said that they had changed their way of working to try to cope with it:

‘The workload is a lot but not too much – if you want to get through it, you’ll get through it ... People tend to do the work to pass exams rather than to actually learn it ... I think if there weren’t so many exams, then people would not be doing so much work ... it’s only because you get examined on it that it seems like a lot ... [If there were fewer exams] a lot of us would probably still do some work but not as much ... People are used to getting good grades [at school] so we still want to do quite well ... and that’s why everyone works so hard.’

‘I knew it was going to be hard and I know that sometimes this year has got a bit harder but then there *is* a lot – you can never learn it all but by this time I wouldn’t try to learn it all, which is different. I had less work to do in first year and I probably spent more time studying then than I do now.’

Still others in the traditional course, generally those with somewhat different pre-course experiences and cultural backgrounds, had expected the workload to be even heavier than that which they had encountered. One had already completed a degree abroad and had found that her previous course had involved a considerable volume of

work – she had had a sports scholarship and had been required to combine sports activities with a heavy academic course. Another student compared her experience on the medical course in Glasgow (in terms of the hours spent in lectures and labs) with what she knew (secondhand) of the medical course in what would have been her ‘home’ university in Singapore and thought that the Glasgow course ‘was really OK’ and that ‘it was actually quite relaxing.’ However, she concluded that, when the amount of material they were expected to cover was taken into account, the overall workload of her course in Glasgow was less than relaxing!

‘As I go along, I realise that there is so much to read up [and] to study. Because of the content, there is so much, you can’t finish [the] reading.’

Another student from a similar cultural background had also expected a heavier workload than she had encountered:

‘It’s just something that everybody tells you – how hard it’s going to be – so, when you’re actually out there doing it, it’s not so bad after all!’

8.7.3 Summary of students' perceptions of volume of work

The expectation, on the part of interviewees in both courses, was that their medical course would involve them in an extremely heavy workload. However, the students' actual experience of the workload in the two courses differed. The views of those in the PBL course were consistent in that they found the first year workload far lighter than anticipated while their second year had increased sharply in comparison. Many expressed a desire for greater guidance from staff about what was expected of students in the PBL curriculum. The views given by the traditional students were more wide-ranging, representing students who found it almost impossible to cope with the volume of work, those who acknowledged it was heavy but adopted certain attitudes towards it or changed their strategies of working in order to cope with it, and those, generally with broader pre-course experience and different cultural backgrounds, who had anticipated that the workload would be even greater than they had found it to be.

Regardless of how closely their experiences of the workload matched their pre-university expectations of it, many interviewees in both courses emphasised that the work itself was not difficult, there was simply a considerable quantity of it.

CHAPTER 9

ANALYSIS OF INTERVIEWS II

STUDENTS' PERCEPTIONS OF KEY FEATURES OF MEDICAL COURSE AND APPROACHES TO STUDYING

9.1 Introduction

This Chapter outlines the extent to which the interviewees judged their respective medical courses to have been characterised by specific features, such as thinking independently, the integration of different subjects and the solution of problems, which might be expected to distinguish between the traditional and PBL courses. Reported in greater detail are the approaches to studying used by the interviewees in both school and university and the extent to which these had been modified as a result of the experience of undergraduate study. Thirdly, there is a description of the interviewees' explanations of their C→A or A→C shift during their first year in response to the sentence stem about exams/assessments in the learning perceptions questionnaire. This change in response from one extreme answer to the other was the criterion which had been employed in order to select questionnaire respondents for interview. The last section in the Chapter describes the interviewees' responses to the final question in the interview, a completely open-ended one in which they were

asked if there was anything, positive or negative, that they would like add about their first two years' experience of being a medical undergraduate.

9.2 Students' perceptions of specific characteristics of the two medical curricula

One of the two checklists completed by the students during the interview asked them to gauge the degree to which they thought that their medical course in general reflected ten features which might be expected to be associated differentially with a traditional lecture-based course and with a problem-based learning course. The features, adapted from those used in a study by Kaufman and Mann (1996a), were the following: *'learning of details'*; *'understanding of principles and being able to use them'*; *'integrating different subjects or topics in order to solve problems'*; *'making decisions on your own'*; *'thinking independently'*; *'solving problems'*; *'gathering and analysing information'*; *'stimulating and enjoyable'*; *'has stimulated you to learn more'*; and *'has stimulated you to read medical literature'* (Appendix 2.4).

Figures 42-51 illustrate the extent (small/moderate/large extent) to which interviewees in the two courses thought their particular curriculum was characterised by each of the ten features. 'To a small extent' combined responses '1' and '2' in the 5-point response scale shown in the interview checklist (Appendix 2.4); 'to a moderate extent' represented '3' on this scale; and 'to a large extent' combined

responses '4' and '5'. Inspection of the bar charts shows that, in almost all features, there are differences between the responses of the interviewees in the two courses and such differences tend to be in directions that might be expected, especially in view of the aims and design of the problem-based learning curriculum. Although the bar charts are based on small numbers of interviewees, in some features the differences between the two groups are so clear that it seems unlikely they have occurred by chance.

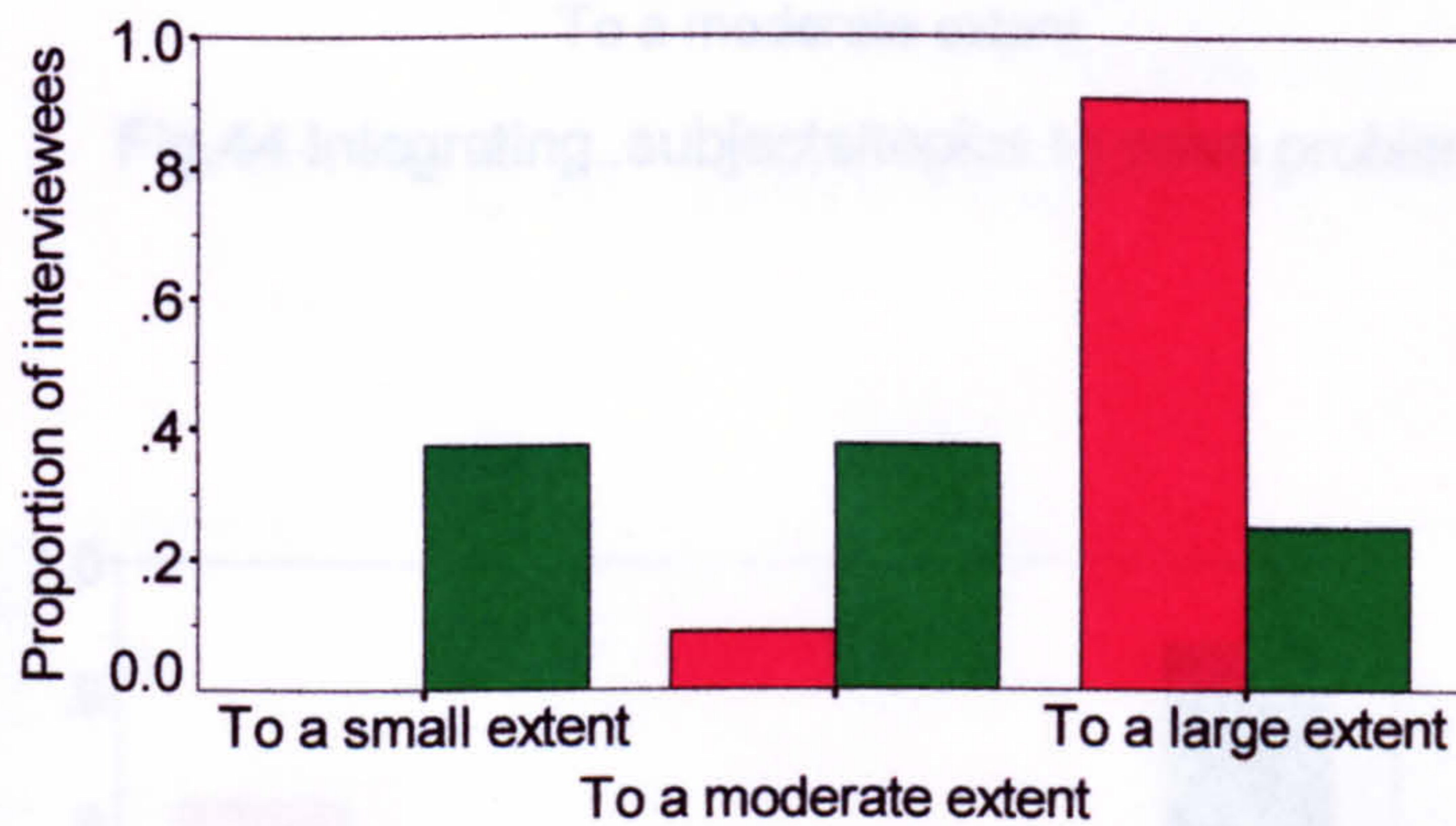


Fig. 42 Learning of details

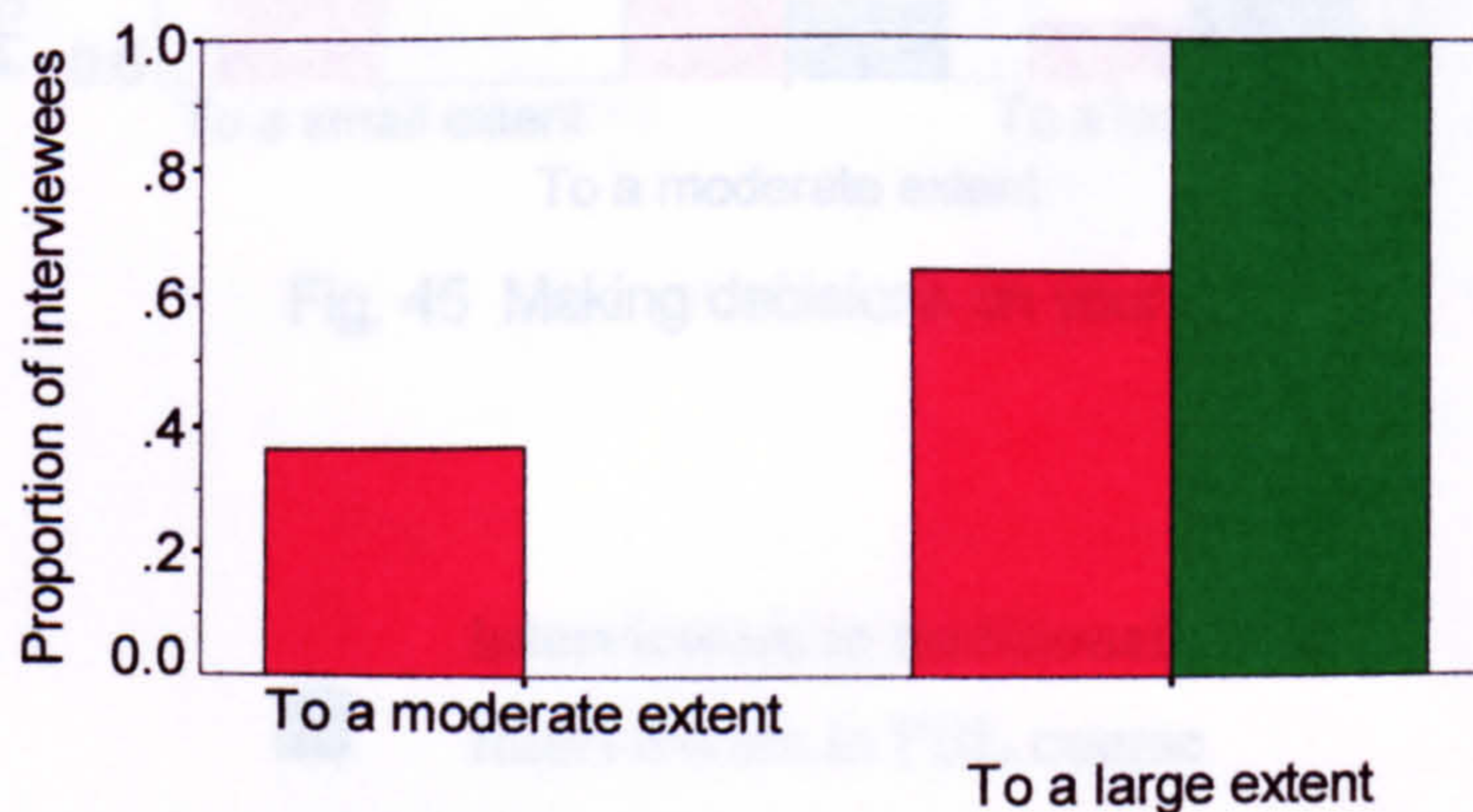


Fig.43 Understanding and application of principles

- Interviewees in traditional course
- Interviewees in PBL course

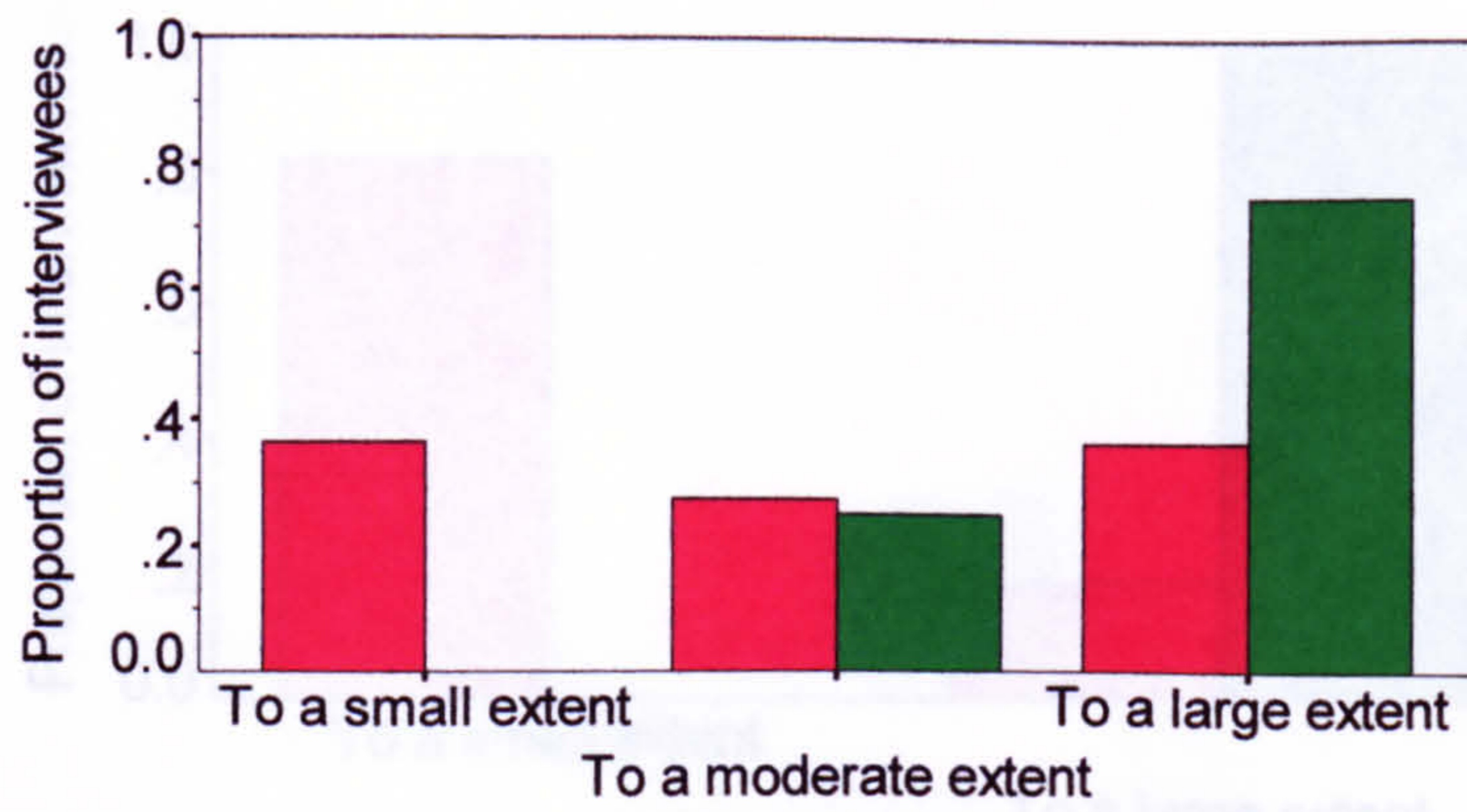


Fig.44 Integrating..subjects/topics to solve problem

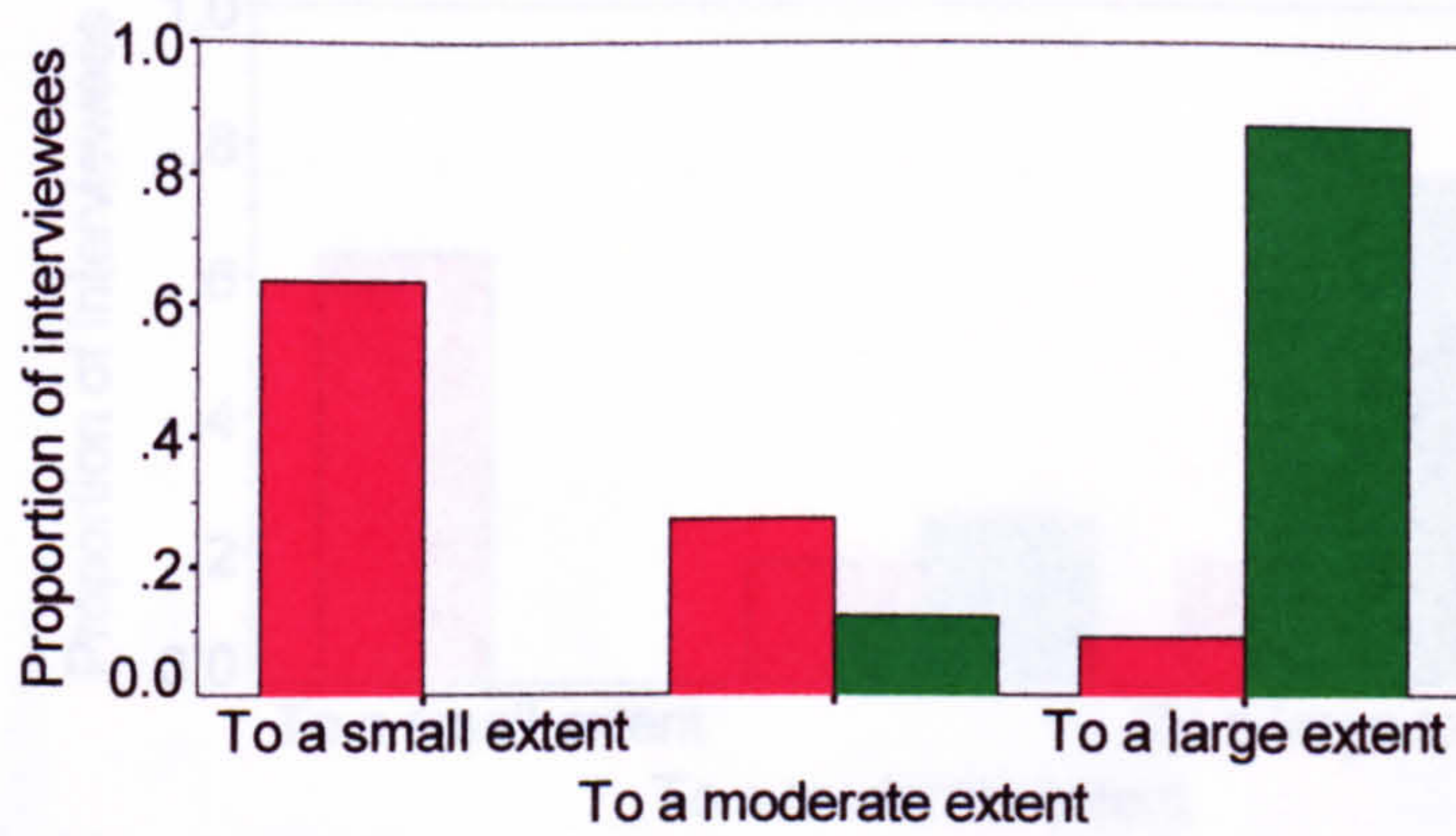


Fig. 45 Making decisions on your own

- Interviewees in traditional course
- Interviewees in PBL course

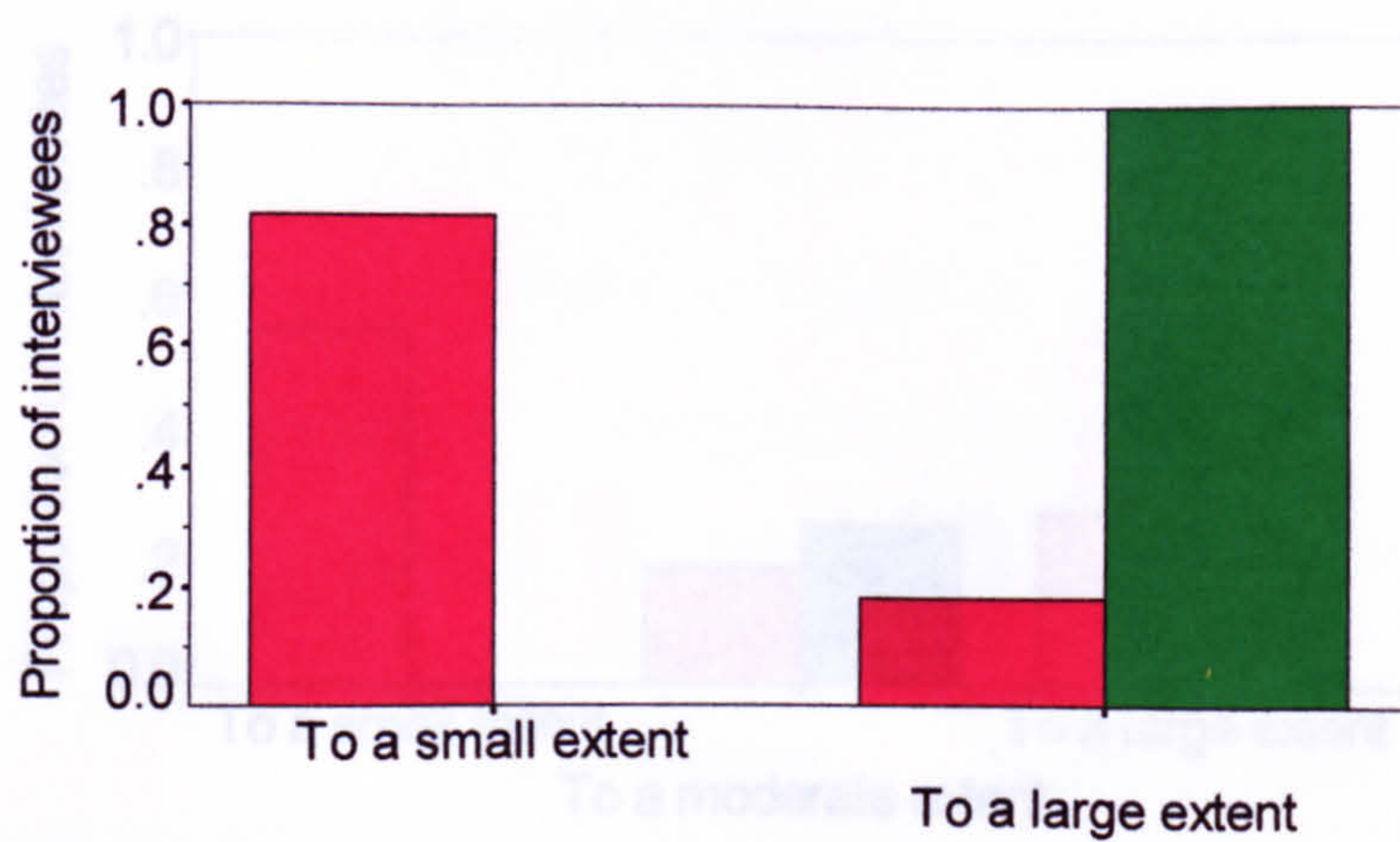


Fig. 46 Thinking independently

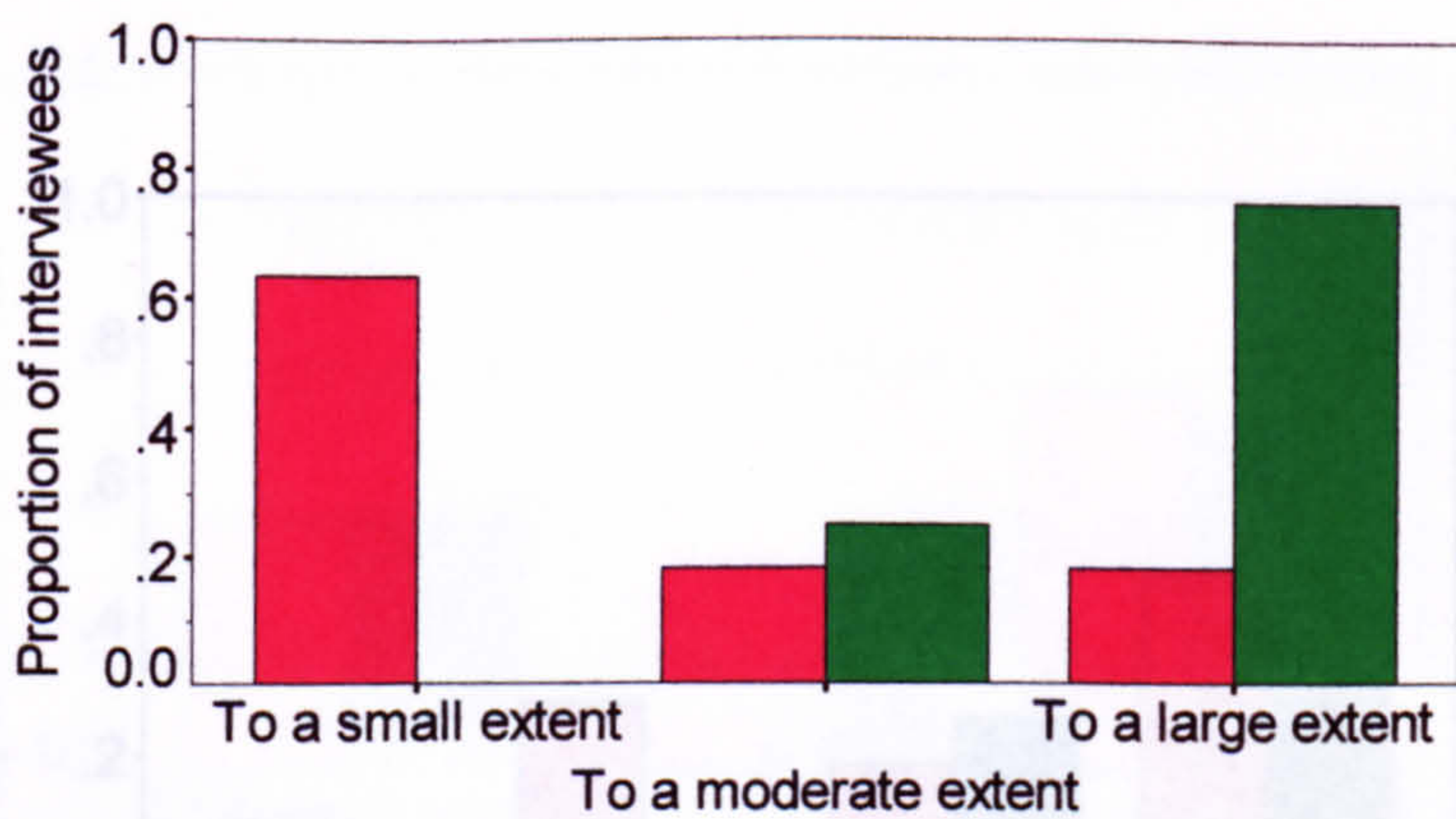


Fig. 47 Solving problems

- Interviewees in traditional course
- Interviewees in PBL course

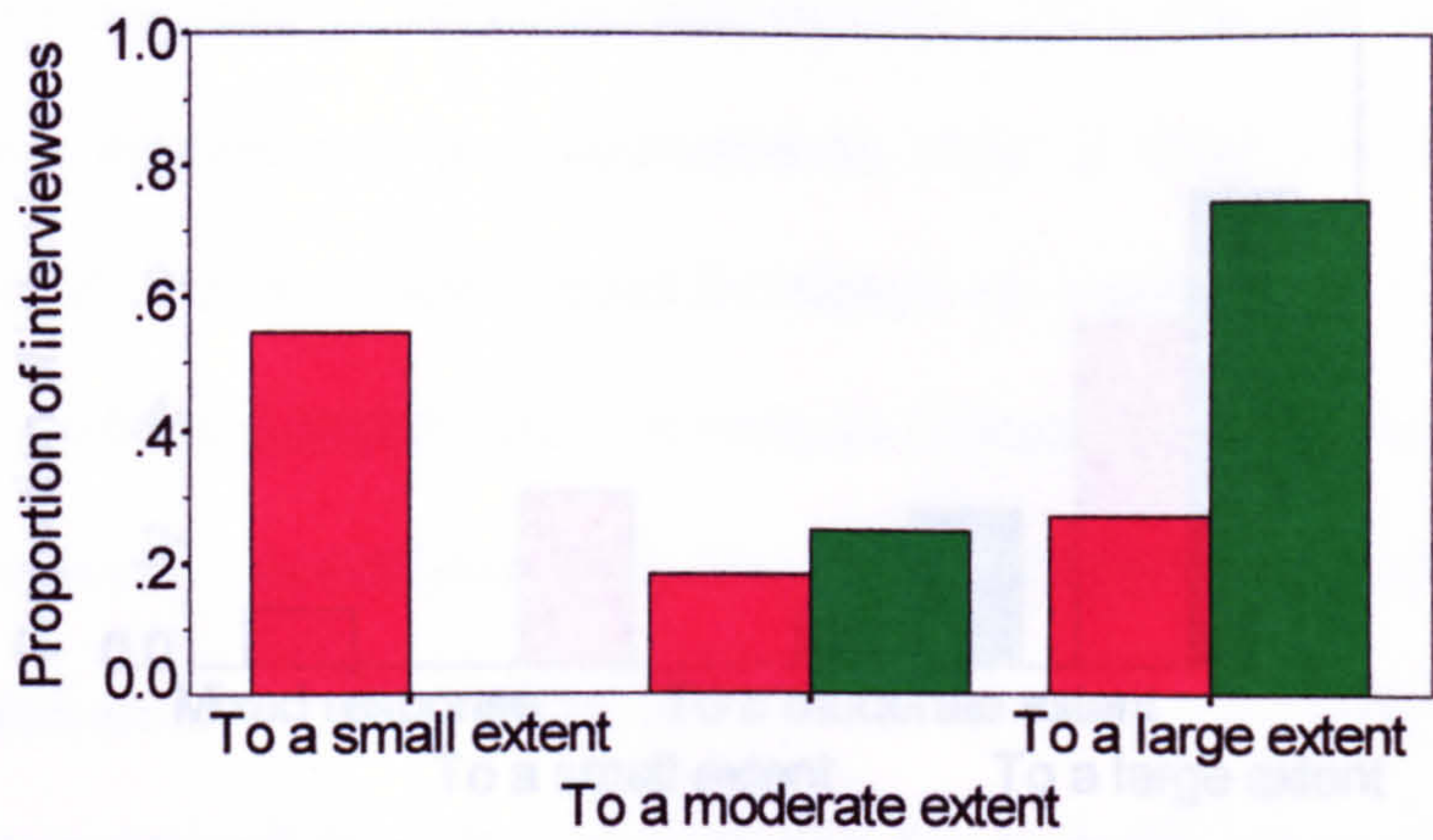


Fig. 48 Gathering and analysing information

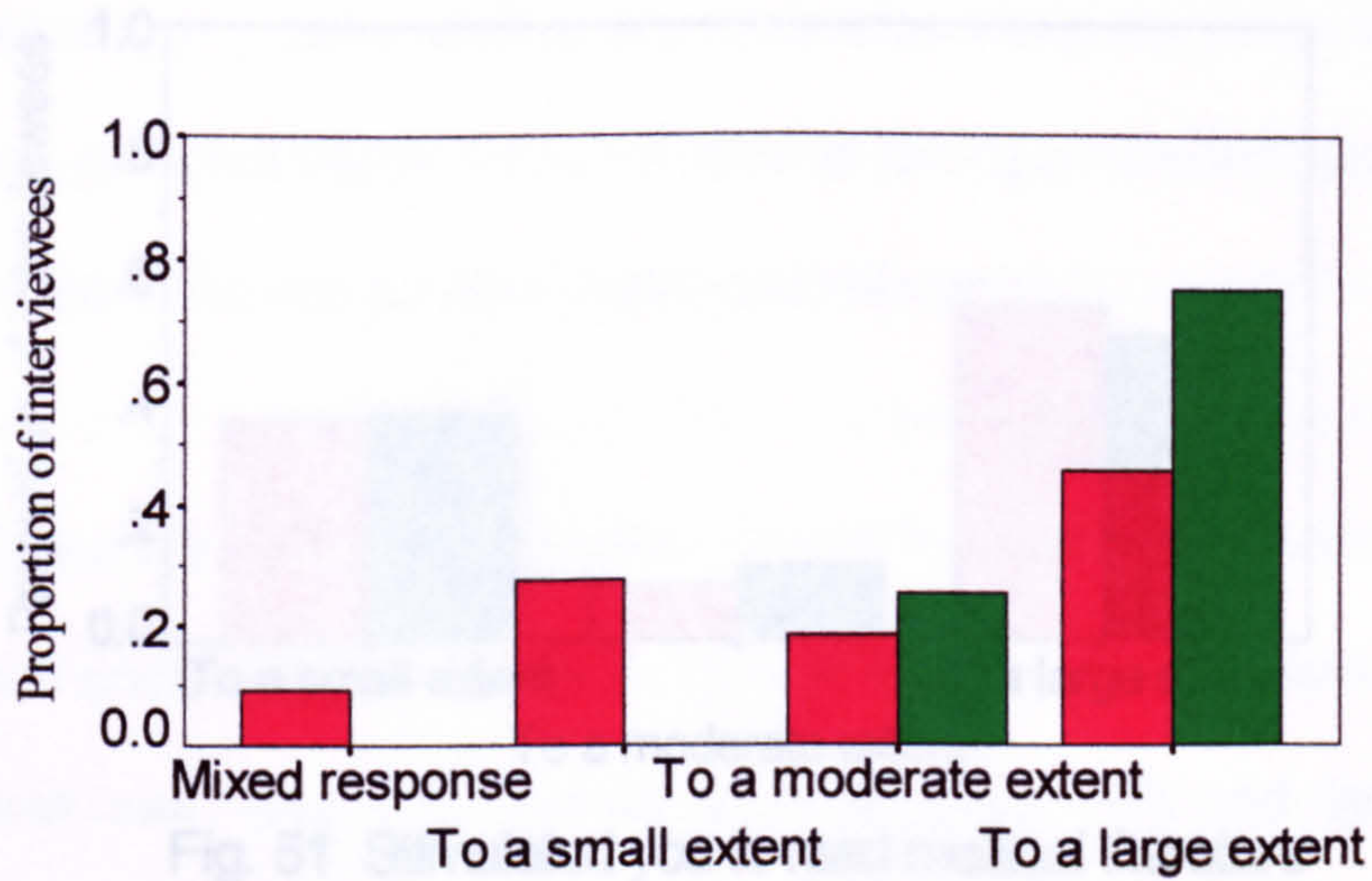


Fig. 49 Stimulating and enjoyable

- Interviewees in traditional course
- Interviewees in PBL course

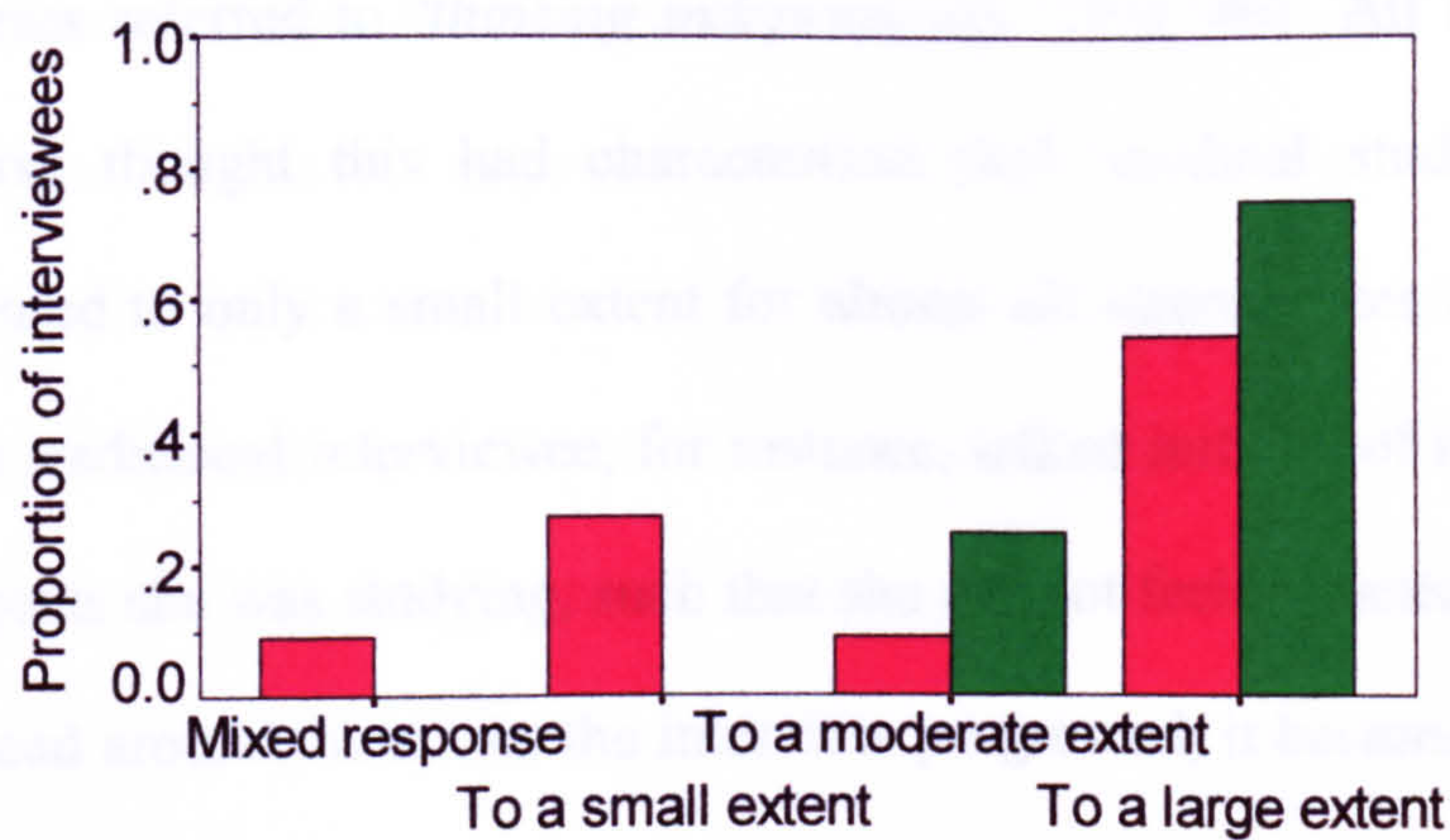


Fig. 50 Stimulated you to learn more

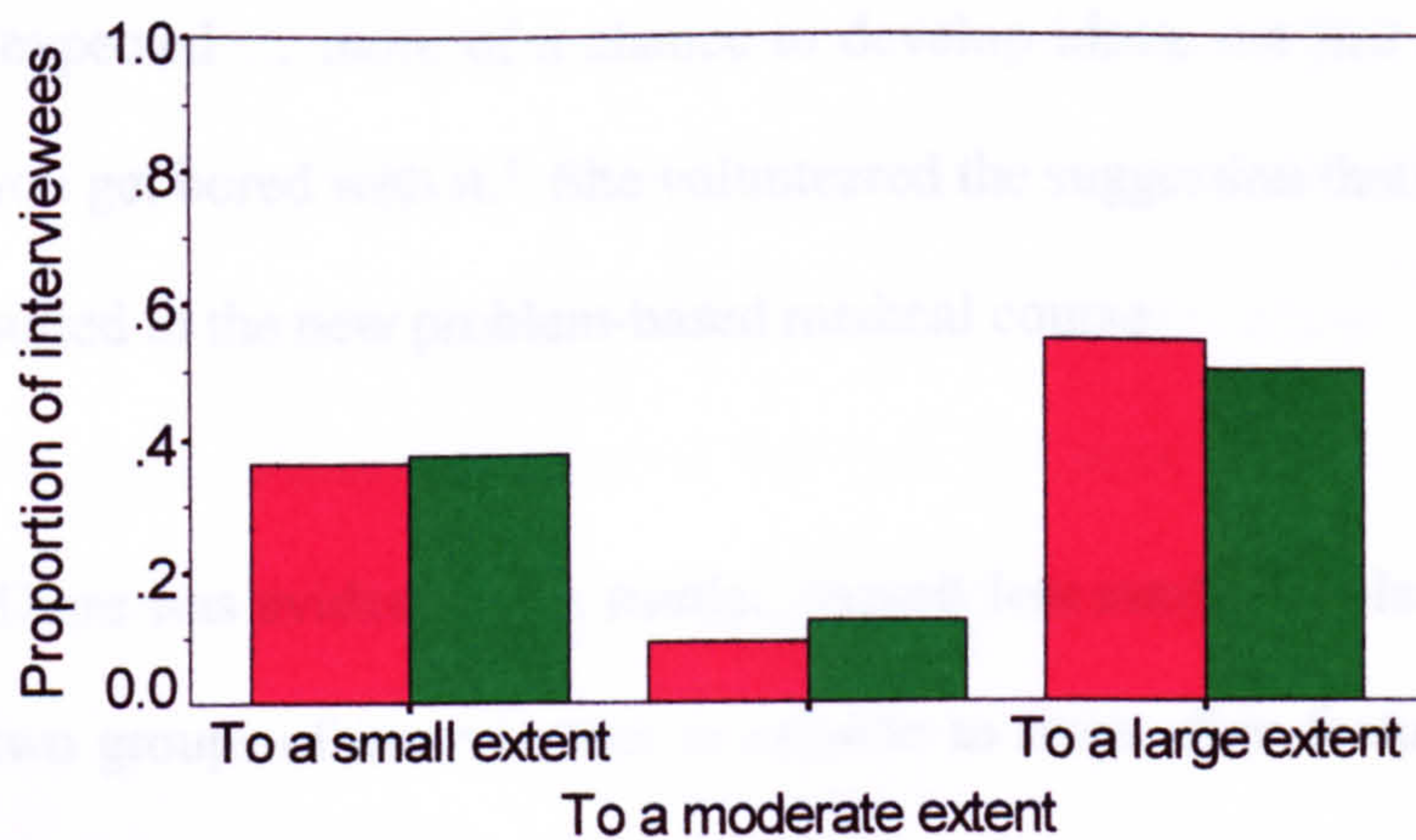


Fig. 51 Stimulated you to read medical literature

■ Interviewees in traditional course
■ Interviewees in PBL course

For example, one of the most striking differences between interviewees in the two courses referred to *'thinking independently'* (Fig. 46). All interviewees in the PBL course thought this had characterised their medical studies strongly whereas it featured to only a small extent for almost all interviewees in the traditional course. One traditional interviewee, for instance, talked initially of her lack of interest in the subjects she was studying, such that she did not feel sufficiently motivated to attempt to read around them. As the interview progressed, it became evident that her lack of interest derived from the pressure she felt to learn a considerable number of facts rather than to think or explore subjects as she had imagined 'scientists' would: 'there seems to be a lot of facts to learn and not much time to understand.' She had 'expected ... more of a chance to develop ideas, not just to sit and learn things off, you get bored with it.' She volunteered the suggestion that she might have been better suited to the new problem-based medical course.

There was evidence of a similar, though less marked, polarisation of responses in the two groups of interviewees in relation to three other features: *'making decisions on your own'* (Fig. 45), *'solving problems'* (Fig. 47), and *'gathering and analysing information'* (Fig. 48). Most of the interviewees in the PBL course saw these aspects as having typified their medical course to a large extent whereas most of those in the traditional course thought they reflected their course to a small extent. Likewise, the *'understanding of principles and being able to use them'* (Fig. 43) and *'integrating different subjects or topics in order to solve problems'* (Fig. 44) seemed to be perceived as stronger features of the PBL course. A similar trend was seen in relation

to stimulation and enjoyment (Fig. 49) and stimulating students to learn more (Fig. 50), though these discriminated less sharply between the interviewees in the two courses. The 'mixed response' shown in Fig. 49 relates to a dichotomy highlighted by one traditional student, who, while finding the course highly stimulating, had enjoyed it only moderately. The same student gave a 'mixed response' to the feature illustrated in Fig. 50. Here he commented that the stimulation to learn more was very selective, being heavily weighted towards clinical as opposed to scientific aspects. The general trend was reversed in the case of the '*learning of details*' (Fig. 42). Here most of those in the traditional course reported this as a strong feature of their course while the responses of those in the PBL course were spread almost evenly across the three response categories. Finally, the one aspect that seemed not to distinguish between the two courses was '*stimulated you to read medical literature*' (Fig. 51), where similar proportions of interviewees in both courses are to be found in each of the three response categories but with the most frequent responses in both groups divided fairly equally between 'to a small extent' and 'to a large extent'.

9.3 Approaches to studying used by students

Most interviewees seemed to find it quite difficult to explain precisely *how* they studied and it appeared that, for almost all interviewees, the interview was the first time they had been prompted to consider their metacognitive processes. One student in the PBL course, for instance, commented that it was strange to try to 'stand back'

and think about how she studied: 'You see, I've never thought about any of this until I tried to explain it there just now.'

9.3.1 Students' use of specific approaches to studying

A second checklist (Appendix 2.3) completed by students during the interview asked them to rate how frequently they used each of the twenty-two approaches to studying, especially as they prepared for exams. The frequency with which students in both courses reported using each approach are shown in the bar charts in Appendix 6. The three response categories shown in the bar charts – 'Never/Occasionally', 'Fairly often' and 'Most of the time/Always' – corresponded to '1' / '2', '3' and '4' / '5' in the response scale in the interview checklist.

Most of the approaches to studying did not appear to characterise students in one rather than the other curriculum. Interviewees in both courses reported using various approaches. They tended to report frequent or fairly frequent use of the following approaches:

I set specific targets during my revision.

I begin to revise seriously for the exams some weeks before.

I read over my own course/lecture notes.

I read recommended textbooks.

As I read textbooks, I write down the important points.

I underline/highlight key words/phrases/sentences in my notes.

I try to understand new material by trying to link it to what I already know or to my past experience.

Similarly, the following approaches were generally adopted more rarely by interviewees in both courses:

I 'cram' for exams by starting revision about a week or a few days before the exam.

For each topic I study, I organise the important headings or key words into lists.

When I get 'stuck', I raise the problem with a member of staff.

Most interviewees in both courses also responded 'Never/Occasionally' to the statement, *I have no specific plan for revision but study as topics occur to me*, but it is difficult to interpret this double negative, underlining the need for this particular statement to be revised and clarified.

A small number of statements also showed similar responses from the two groups of interviewees not because one response category predominated but because responses

tended to be fairly evenly spread across the three response categories. These approaches to studying were:

I read around the subjects.

I learn most of the material 'off by heart'.

I use mnemonics ... to help me remember information.

*I try to work out which questions will come up on the exam
and prepare for them.*

Seven of the twenty-two approaches to studying were reported as being used to differing degrees by students in the two courses. In the case of five of these, the traditional interviewees seemed to use them less frequently than the PBL interviewees, although the frequencies with which they were used were not always clear-cut. The following three (of the five) seemed to be used, on the whole, less often by the traditional and more often by the PBL interviewees:

I write down a revision schedule.

I stick to a revision schedule.

I make summaries of my notes on each topic.

The other two approaches (of the five) were also used less frequently by the traditional interviewees but no single level of frequency characterised the PBL interviewees:

I select specific areas for revision rather than trying to cover everything in the course.

I organise each topic around central ideas or themes.

Conversely the remaining two approaches – of the seven which showed some differences between the two groups of interviewees – appeared to be used more frequently by the PBL students while this time no single response category was typical of the traditional interviewees:

I discuss most of the material with other students.

When I get 'stuck', I discuss the problem with another student.'

One aspect in which the interviewees in the two courses did seem to differ was in the extent to which they reported *changing* their approaches to studying, with those in the traditional course tending to report change and those in the PBL course reporting continuity. This is discussed more fully in the remaining Sections of the Chapter, together with more detailed descriptions of their methods of studying that were volunteered by the interviewees.

9.3.2 Interviewees in the traditional course

Almost all the interviewees in the traditional course reported that they had changed their ways of working from those they had employed at school, primarily in an attempt to cope with the larger volume of work (especially in their second undergraduate year) and the greater diversity of subject matter. Some had also changed their approaches to studying from first to second year. One student who had not considered changing her approach to studying as an undergraduate still noted a difference between school and university: unlike her experience of exams at school, she had 'never felt confident going into any of my exams' at university.

Many of the interviewees in the traditional course stated that they had not had to work very much or very hard at school. For instance, one said of studying at school:

'I really didn't prepare [for exams], nothing until maybe the night before or, for my Highers, two or three days before ... I never really had much problem with exams and I found ...you just learn the concept and apply it, rather than piles and piles of work ...I really didn't have to do that much.'

Although 'cramming' for exams at school seemed to have been the norm for many interviewees, this did not mean that they were doing no work in other ways. One student in the traditional course said:

‘... although I wasn’t seen to be doing work, I was talking to teachers ... just by talking to people I was able to understand it, so ... I had a sort of interest in it ... it didn’t seem as if I wasn’t working and then just cramming.’

while another recalled that at school and college:

‘...I kind of enjoyed myself during the year until exams came and then I would cram all the stuff I had got from the books ... even though I wasn’t studying the stuff I was supposed to study, if anything interested me, I would have gone to the library and read up ...I was always reading science magazines and things like that.’

This student thought that the ‘reading up’ on areas she came across that interested her was something she did much less frequently at university, a point echoed by one or two others, who felt that the volume of work was such that they were struggling to learn what they saw as the ‘basic’, required content in their various subjects and that they simply did not have time to read around and explore areas of particular interest to them.

Many students drew a contrast between the (supplied) sources of material on which they had been expected to draw at school – class notes dictated by teachers, specimen exam questions and answers, and possibly a single, main

textbook in a given subject – and the apparent multitude of textbooks in at least some of their university subjects. One student recalled that, at school:

‘I would only have the set textbook, there was no facility to get any more out of the library – the library was just about English books, and there would be no Biology textbooks in there anyway. So, you would end up with just the one textbook, everyone would have practically the same notes, you would have the stuff you were told in your class, you would take your jotter home and have a look and there would be very little difference – it was pretty much word for word what we were taught.’

and then went on to say, with reference to undergraduate studies:

‘[In comparison] the university was huge – I mean the number of books you were reading alone on each subject – and that’s regarded as not being very specialised ... even in the Reading Room there will be four or five Physiology textbooks and three Anatomy ones And then you check on the computers and there seems to be about fifty different things you can have a look at ... It just gets very confusing when you are trying to look up one subject.’

Although most of the 'traditional' interviewees thought that they studied differently as undergraduates, it was sometimes difficult, even with additional questions, to establish precisely the extent or nature of such change. In the case of one or two students, it seemed initially that it might amount to little more than a change in preparation time: 'I've changed a bit [from school], I start a bit further back now ... I start [revising] sooner in the term.' However, starting earlier *per se* was not necessarily helpful. The same student commented:

'I just panic, I don't know if what I'm doing at the moment is working very well ... no, last term I was pretty sure but this term I'm going back and checking everything, going over everything again.'

Another student in the traditional course, having discovered that leaving exam preparation until the night before the exam as she had done at school was not advisable, reported that she had realised by the end of the first term in first year that she had 'to do more studying'. When asked what she meant by this, she indicated that this meant 'more memorising', 'more learning off by heart'.

At the opposite pole in the traditional group were one or two students who had considerable insight into the changes they had implemented not only in their first year but also again in second year. When asked about how she had prepared for exams at school, one student (with the clarity of hindsight) felt that how she had studied at school was largely irrelevant for university – 'a big waste of time, more of a show' –

and had discovered that she had 'to learn how to study from scratch' since she had been 'terrible at studying' in first year:

'I used to go through phases of adopting different people's methods of studying – I think I went through every method of studying you could possibly have because I was with so many other medics in the halls [of residence] ... sometimes I'd be up until two o'clock in the morning and I would think I had never achieved anything.'

In general, in first year, she concluded that she was 'trying to think too much', 'looking at the details without focusing on the basics that were there in the lectures'. In contrast, in second year, she concentrated on lecture material and elaborated on it from textbooks. She was also employing mnemonics, which she thought were 'tremendous for learning lists in Anatomy and Physiology'. In her approaches to studying, she had become 'certainly more professional – before I was jumping about, now it's much more logical'. Near the end of her second year, therefore, it seemed that, largely through a process of trial-and-error, this student at least had gradually come to recognise – and accept – the ways of working that best suited her.

Despite the fact that most interviewees in the traditional course tended to feel uncomfortable and vulnerable about not covering everything in the course when revising for exams, they clearly thought there was a need to select areas for exam

revision. For most of the interviewees, it was difficult to gauge the extent to which such selection was carried out on a carefully planned basis. One or two interviewees, however, could be regarded as adopting a clearly strategic approach as they tried to assess from previous papers what was likely to be included in forthcoming exams and planned essay answers in advance.

9.3.3 Interviewees in the PBL course

In contrast with the interviewees in the traditional course, those in the PBL course thought that they had largely retained the approaches to studying they had used at school. One student reported that he continued to revise by repetition, by reading and re-reading, essentially learning material 'off by heart', while emphasising that he found no problem with understanding material: 'It's not difficult, the textbooks explain it all very well.' Another student said that she had 'learned things off by heart' at school because she had found she was 'no good at making revision notes – I would tend just to think all of it's important and write everything out again'. She reported that she had continued in this way at university but it also emerged that, in an attempt to cope with the increased volume of material to be learned, she was 'making out cards and flow charts more':

'Last year I had them up on the walls round my room with the things that I found the hardest and I read them every night before I went to bed. I've seen me with four sheets by the end of my bed.'

Another in the PBL course was an enthusiastic user of mind maps, and had been since she had first experimented with them in her third year in secondary school. Although she agreed she learned and retained more by using mind maps, she stressed that 'it was just a much more interesting way to do it'. She also put them on the walls of her room, along with other visual prompts, 'like a picture of the heart on the wall that makes it easier than going through a list of description.' She had considered changing from this way of working – 'just to do something different' – but had decided not to change since 'there's all this evidence about how it works.'

A number of the interviewees in the PBL course recollected that, at school, they had been accustomed to establishing understanding as the basis for their learning and they stressed their need for understanding what they were learning in order to learn effectively:

'I can't learn things well if I don't understand them because then it's just repeating them back and I think you're more likely to get things mixed up ... But I think if you can question and put it down in different ways, you understand it better.'

These students contrasted this approach with what they regarded as the less effective and less permanent learning resulting from memorising and often stated that they were unable to learn in this way. Despite this, at least one or two were finding that, because of the pressures on their time, they were having to sacrifice understanding for the apparently quicker memorising:

'[At school] I was never one who would memorise stuff ... I always tried to understand it and then work it out from basic principles ...but [at university] towards the end [before the exams] I thought, "Oh, there's no time to actually understand it, I should just memorise it.", so I did and I didn't really understand it.'

In a similar vein, another in the PBL course said:

'I've finally got on top of the basics, I can understand the work, I can get back to understanding, but, to understand the subjects, you have to work hours and hours on end. It's easier just to learn a disease and then just churn it out.'

9.3.4 'Re-writing' of notes

In response to initial questioning about methods of studying used by the interviewees, a recurring theme from students in both courses was the 're-writing' of notes. At first this could be interpreted as a relatively shallow, passive approach to studying. Generally, however, when this response was probed by asking interviewees to explain what they did when they re-wrote notes, it was often the case that it did not simply consist of a neater and more legible reproduction of existing lecture notes (frequently

acknowledged by interviewees as ‘probably a waste of time’) or a copying out of notes from book chapters. Instead, for students in the traditional course, it involved elaborating on lecture material, incorporating additional material from textbooks and, in one or two cases, other resources, and a focus on specific parts of the lecture that had not been fully understood. Similarly, students in the PBL course were drawing on course notes and material from perhaps two or three textbooks in a given subject:

‘Because there are so many different textbooks for one subject, for example, Physiology ... it’s a case, for me, of trying to use the most basic [textbook] and then use another to go into it in greater depth, and then read another one and, if there’s more information, just add to my notes ... It’s a way of seeing if I can manage it or not – see if I can read it in a different textbook and understand it ...’

In contrast, one student in the traditional course stated that she did not take notes from reading nor did she write out summaries of her notes, as other students reported they did prior to exams. Instead, after reading her notes and textbooks, she summarised the material verbally by addressing the walls of her room. Unlike most of the other interviewees, this student did not feel the need to write down notes from her textbooks – if she read and understood what she had read, then she remembered it. Another student in the traditional course was more typical of the interviewees as a whole:

'I learn by writing down – I can't just read and remember. I have to read it, then write it down and then I actually have to think about it.'

Finally, one of the interviewees in the traditional course summed up the complexities of studying in the following way:

'... from my own experience, I didn't realise that studying is not just about being able to do a number of things and throwing them up in the exams. It's more ... like gathering information, totally understanding it and being able to apply it – and that's quite something more.'

9.3.5 Summary of students' approaches to studying

In terms of the frequency with which interviewees said they used each of the twenty-two listed approaches, more similarities than differences were evident between the traditional and PBL interviewees. Many made the point that they used different approaches in different subjects, for example, learning material 'off by heart' in Anatomy but using a different approach in Pharmacology when learning about the range of side effects of a given drug. Interviewees in both courses reported using about a third of the listed approaches reasonably frequently, fewer were used infrequently, and a similarly small number were used in almost equal measure across the three response categories of 'Never/Occasionally', 'Fairly often' and 'Most of the time/Always'.

Some differences between the two groups of interviewees emerged in the frequency with which seven of the approaches were used. Most of the seven approaches seem to be used less often by students in the traditional course and referred to aspects such as writing down and adhering to a revision schedule, selecting specific areas for revision, summarising notes on specific topics, and organising topics around themes or main ideas. Finally, in view of the prominent role of group work in PBL, it was not surprising that the PBL students used their co-students more frequently than did the traditional students to discuss course material and any problems that arose.

In general discussion during the interviews about methods of studying, 're-writing of notes' was a recurring theme with both groups of interviewees. Usually this method was not as superficial as it might appear. For the traditional students, it involved using textbooks and occasionally other resources to expand on lecture material, with particular attention paid to areas that had been less well understood. Likewise the PBL students elaborated their course notes using material from two or three textbooks.

One of the main differences between the two groups of interviewees was the degree to which they thought they had changed their approaches to studying from school to university and even, in one or two instances, from first to second year at university. Almost all the traditional interviewees reported that they had changed their approaches to studying in an attempt to cope with the much greater volume and diversity of course content in their undergraduate studies. Many said that they had not required to work excessively at school/college, often leaving exam revision until the night before or, at most, two or three days before, the exam. However, a number pointed out that, although they had 'crammed' for exams, they had worked in other ways prior to the exam, for instance, by discussing topics with teachers and by reading up on whatever interested them in the subject. Many commented on the contrast between the narrower, more manageable sources of material with which their teachers had provided them at school and the sometimes confusing abundance of undergraduate textbooks even at the less specialised level of first and second years.

Overall it was often difficult to define the form or extent of the changes in approaches on the part of the traditional interviewees. Some referred simply to starting revision earlier in the term or memorising more, a few had evolved an understanding of the approaches that seemed to suit them, and others adopted a strategic approach based on previous exam papers.

In contrast with the traditional interviewees, those in the PBL course thought that, in the main, as undergraduates, they had continued to use the approaches to studying they had used at school/college. Although one or two referred to learning by rote, a number referred to more active and creative approaches, such as the use of mind maps, pictures, and diagrams. A number of interviewees recalled that, at school, they had used, indeed had needed to use, 'understanding' as their foundation for effective learning, although one or two had found that, in undergraduate study, they had had to resort to memorisation at the expense of understanding in the interests of speed.

9.4 Students' explanations of their C→A or A→C shift during first year in response to sentence stem about exams/assessments

A change in response (C→A or A→C) between the beginning and end of first year to the sentence stem about exams/assessments in the learning perceptions questionnaire was the basis on which students had been selected for one-to-one interviews. Towards the end of each interview, each student was informed about his/her change in response and asked whether, with the advantage of hindsight, it was an accurate

reflection of what they could recall of their first year experience. The sentence stem and its associated 'A' and 'C' responses are repeated here:

'My job in assessments and exams is ...'

'A': 'To give back the facts I have learned as accurately as possible. I prefer questions with single clear-cut answers rather than open long questions.'

'C': 'To answer the questions, including what I have been taught and what I have found out for myself from reading or other sources. I dislike questions which force me into a fixed answer (such as multiple choice) and prefer open questions in which I have room to show my own thinking.'

9.4.1 Interviewees in both courses who changed from 'A' to 'C'

In the case of those interviewees whose response had changed from 'A' to 'C', many in both the traditional and PBL courses thought that this did indeed mirror their perceptions at the two points in time, the shift being explained in terms of what they had been accustomed to doing at school (the 'A' response, given about halfway during the first term of first year) and what they thought they needed to do at

university and for a career in medicine (the 'C' response, given towards the end of first year). For instance, one student in the traditional course recalled that:

'When I first started [university], I thought it was going to be very important to just learn what we had been told, and I actually did that for exams. But then I thought, "I'm not understanding – I know it but I'm not understanding it. I would rather understand it so that I can start reading about it." Then I started going to the library more, which I hadn't done for ages, and really thought that was the better way to work.'

She also volunteered the following comment about the multiple choice format of exams/assessment:

'Multiple choice is a nightmare – I don't like it, I don't like it at all because, if you're not right, there is no grey area. There is black and white and that's it, and you lose marks as well, in a lot of subjects, if you get it wrong, so you end up frightened to put anything down! ... There is no scope for your own input really.'

Throughout the interview, another student in the traditional course emphasised that he did not want to simply learn facts, as he found he was doing in Anatomy where 'this

goes there, that does this, and this applies to that.’ Because it was so factual, he found it ‘boring’ and instead wanted to explore the ‘vague’ areas in medicine, e.g., studying the side effects of drugs in Pharmacology he thought was exciting. He summed up his preferred way of studying:

‘I like going home, reading, showing you know a little bit more. I like getting credits for that rather than being told something, writing it down, copying it down. My memory’s not like that – it’s more like knowing it and understanding it, then putting it back in my own words ... giving your own point of view on it.’

A student in the PBL course echoed the contrast drawn between expectations of learners at school and university but, like others in the PBL course, added the rider about the reality of the nature of university exams:

‘You’re just used to being at school and you had to use the exact words [in exam answers]. You word it in a certain way and that’s your mark ... you miss out all the extra thrown in ... whereas in first year [at university] you just seem to get told, “Do extra, do extra, you can go and find out other information. You’ll get asked about some things you might never have done but you might get asked about something you’ve done in lots of

detail, and you can put all that information down.” But, if I’m doing an exam, I don’t think that’ll still happen ... In the actual exam, you didn’t have enough time, you just had to put down the basic points ... it was mostly factual ... You couldn’t go, “Well, but ...” ’

A number of interviewees in both courses who had shown the A→C shift saw it as being related to preparation for their career in medicine. One in the PBL course stressed the fact that she was going to work in medicine and that, as a practitioner, ‘it’s not just turning out a list of facts because you’re going to have to understand, you’re going to have to tweak things ...’. Similarly, an interviewee in the traditional course made the point that:

‘Now I try to look at it [studying] from the angle that I want to learn because it is useful to me as a doctor ... just to find out for my own good rather than [simply for] passing exams. It’s different [from school] because I tend to regard this as medicine as a career rather than something I’m simply studying ... I’m studying for life more than anything.’

Two students in the PBL course gave rather different accounts of their apparent A→C shift during first year. The first described himself as probably being between the two types of responses but it became clear that essentially this reflected a strong desire to

know exactly what was expected of him in exams/assessments, 'I like to know where I am.' He went on:

'If I knew it was straightforward regurgitation of facts, then I would just prepare for that. If it's about understanding things, I'm better at that than some people so it'd probably be beneficial to do a bit less work ... I don't like things where you have to understand things and they ask you to give details on it. I prefer just to have an overview of things ... I don't see it as the sort of thing where you have to sit there and understand things. I haven't so far sat down and said, "Gosh, I don't understand this." It's fairly obvious ... as soon as you go through it, you understand it.'

The second student admitted that, when they received the second learning perceptions questionnaire in their PBL group, the group members thought they knew the responses that were wanted: 'I think we actually wrote down what we thought you wanted.' However, when in the interview she was asked to think about her first year experience again, she felt she would not have endorsed a 'C' type of response to the sentence stem at the end of her first year and gave the following reason:

'I would like to think there was a certain standard of knowledge that people should have, to be at this level ... I should expect

that they [university staff] would want that to come back [in exams] and any extra is outside your sphere of knowledge for that time ... but right now I don't think there should be any need in the exam to prove that. Probably, as in any exam, there are odd questions, just to pick out the better ones [students] but generally speaking I think there should be some kind of standard.'

9.4.2 Interviewees in both courses who changed from 'C' to 'A'

In the case of those interviewees who had shown a C→A shift in their response to the sentence stem about exams/assessments, it was more difficult to establish clearly the reasons underlying the shift or to readily classify them in a meaningful way if they did emerge. It was possible that, for some interviewees in both courses, the shift represented the honing of a strategic approach to preparing for exams in which the students felt they had learned what was expected of them, what was likely to 'come up', and they had prepared for these areas, especially in the case of the professional exams. One student in the traditional course, while describing essentially a strategic approach by the end of first year, also said that the 'C' type response she gave at the beginning of first year was the response she thought she should give, in other words, she thought that the 'ideal' answer to the sentence stem was obvious. In comparison, the 'A' type of response that she gave at the end of the year was what she *actually* thought.

Like many students mentioned above who had shown an A→C shift, one of the students (who was in the PBL course) also drew a contrast between her school and undergraduate experience but in the opposite direction. She felt that, in her 'A' levels, she had had more scope for giving her own ideas and views and this was different from her experience of first year at university:

'There is just so much that you have to know ... just getting the time in the exams, which is so limited, to get it back. You've

got to give back what you know is going to get the marks. If you get a question for three marks, and you know three things, three main topics, that they want down, you don't have time to say, "So-and-so is more important than so-and-so, this might change ..." You just get it down.

She added:

'Probably the [admission] interviews contributed to that [perception of exams at the beginning of first year] as well because a lot of the questions were about what you would do in this situation, what did you think about it, "Tell us about your views."'

Two interviewees, both of whom were in the traditional course, reflected movement that could be more readily interpreted as a negative one. The first student conveyed very strongly in the interview her lack of interest in and motivation to study the subjects in her course, and the lack of opportunity to discuss topics with lecturers and to explore and question, activities that she associated with being 'scientific'. She had been very discouraged to discover that she was expected 'to learn lots of facts, not to think' in first year and this had come in sharp contrast to her school experience. She was not convinced that she would complete the medical course. Instead she was considering pursuing an area that was of real interest to her (immunology), possibly through the intercalated degree.

The shift from C→A on the part of the other interviewee is less easy to explain. This interviewee had been extremely dissatisfied with her marks at university and had decided, during the course of her first year, that something ‘was terribly, terribly wrong’ with her approaches to studying. At the end of first year, when the learning perceptions questionnaire was distributed for a second time, she was trying to change her learning strategies. Her confidence had also decreased very sharply in first year as a result of an academic performance that was unusually low for her and that she found very disappointing. It was clear that first year had been a traumatic one for her. However, these factors did not provide a ready explanation of the C→A shift in her responses, since her school strategies with which she had started first year had consisted of memorisation and ‘regurgitation of facts’, approaches that would have been at the opposite pole from those usually associated with a ‘C’ stance. Likewise, the approach she was trying to use by the end of the year, i.e., studying ‘with interest’, did not account for the ‘A’ response she gave in the learning perceptions questionnaire towards the end of her first year.

9.4.3 Summary of students' explanations of their change responses during first year

Those interviewees in both courses who had demonstrated an A→C shift thought that it had described a change in their perceptions of what was expected of learners in exam and assessment situations, from expectations associated with being a school pupil or college student (at the beginning of first year) to those associated with being a university student (near the end of first year) and, at a later stage, a practitioner in the professional field. Some students, however, felt that, in the exams, there was a need to 'get down the basic information' and little time available to discuss it.

Reasons for the C→A shift were more difficult to determine or categorise. It seemed to encompass a strategic approach to exams/assessments and more negative changes which were possibly indicative of disappointment with academic performance and disillusionment with the course

Finally, one or two students admitted giving a 'C' response wrongly, either at the beginning or end of the year, because it seemed to be the correct, desirable, or ideal, response to the sentence stem.

9.5 Experience of being a medical undergraduate: unstructured final comments made by interviewees

Each interview ended with an invitation to the student to make any comments, positive or negative, that they wished about their experience as an undergraduate during the previous two years. Many of the comments were not new in that the areas to which they referred had been discussed at earlier stages in the interview if not by that particular student then by others. However, there was little overlap in the facets of their undergraduate experience on which the two groups of interviewees chose to comment.

9.5.1 Comments made by interviewees in the PBL course

Almost all the interviewees in the PBL course used the opportunity to comment on the course itself in a positive way. Also it was striking that almost all of them referred specifically to their enjoyment of it, with particular mention being made of the hospital visits.

‘I’ve enjoyed it, I’ve really enjoyed the course, I’m glad I picked it. I know some people say they don’t think it works but I think it does. I definitely think it’s probably a better way of learning, even just from going into the hospitals.’

'I'd say it's been enjoyable most of the time. Find the vocational studies and going to the hospitals ... probably the most enjoyable part of it.'

'Everyone keeps saying, "Is this new course better than the other one?" but that is really hard to say and I didn't do the old one. I think I'm enjoying this more than I would have enjoyed all the lectures and certainly all the dissection ... I like the way that there was, when we went on a [hospital] visit, a House Officer there, there was the opportunity to see someone working exactly ... I think it's a much better idea, meeting patients.'

These quotations illustrate well the positive nature of the comments volunteered by the PBL interviewees in almost all instances but interviewees also highlighted areas of the course that they thought needed some re-thinking, such as the value of having so few lectures, and the absence of exams during the academic year until the end-of-year. One or two students looked beyond the course to the wider context after graduation, i.e., to the capability of the PBL course to equip its students for the range of professional settings that they thought the traditional course had done.

The point about the end-of-year exams was made by a number of interviewees. Their concern was that, coming right at the end of the academic year, especially the end of June in second year, made for a 'really, really long year' with no feedback about their

likely performance in exam situations, as distinct from continuous forms of assessment. Although none of the interviewees wished to reinstate the number of exams that there had been in the traditional course, there was a desire for the incorporation of more exams – for example, at Christmas or at the end of each term – in order to give students practice for the professional exams and regular, periodic feedback on their progress in a more comprehensive way than was possible with more narrowly focused course assignments. It seemed that the reduction in the number of exams in the PBL course, rather than decreasing the pressure on students, had perhaps increased it. One student echoed the views of others when she said:

‘They say that essays are a form of continuous assessment but I don’t think ... they test how well you’re working at all or test your knowledge in any way ... it doesn’t help at the end of the day for the exams ... especially for the volume of work we’ve done this year, and you’re expected to learn all of that for two two-hour papers, it’s really a lot ... Instead of having essays, have a small test at the end of every term, even if they just counted for the same percentage as one essay. I think it [one or two exams at the end of the year] puts an awful lot of pressure on you at the end of the year.’

A few students thought that 'it would be nice to have a few lectures now and again' to provide a structure or 'pegs' for course content, as the following student described:

'We do get lectures occasionally but they say they're not compulsory to go to, they're nothing to do with your course, they're for interest' which is nice, but what I think might be an idea would be a summary lecture at the end of your week about the PBL's, just picking out the main points and what you should have taken from it and at what level. By then, they're not telling you your PBL, you're supposed to have done it, it's not giving you information, it's just giving you a wee outline to see what you've missed out. Or even if they gave you a lecture about the basics, or underlying principles, and then you could go to your textbooks and happily go into the deeper stuff and learn about it yourself but, without the basics, which we don't have, it's very difficult.'

Other students made similar points but saw them as related to a need for more support from staff:

'We could certainly get a bit more support from staff, that would be helpful. It's awful like an Open University course, I think – get your topic and then go and do it yourself – that's good and bad. Maybe a few formal sessions would be useful. I think it might just be because

they don't know themselves what we're meant to have to know. Last year they were refusing to give us objectives at first because they said it was against the ethos, so that makes you think the ethos is to make it as difficult as possible ... they seem to prefer that we figure out what's not important .. if we ask if we need to know that, they say there's no harm in learning that anyway but there is, it's dead expensive for us in terms of time.'

Lastly, one or two students expressed concern about the implications of the PBL course for their choice of careers in medicine. One who was interested in both the intercalated degree and forensic medicine wondered if she would be able to pursue these options in the light of what she regarded as the weaker scientific grounding that this course would give her. Another student felt that:

'A lot of us feel that in the old course they do a lot of dissection and they do all the real details, like nerves and everything, but we haven't done that. Basically we go in and say, "This is a lung, this is the kidney", all the major organs, but you don't go into the very detailed study so, to me, I think this course is good for people who want to become clinicians or GP's' ... but not really so much for people who want to do research or surgery. Maybe I don't know too much about it but that's what I feel: we don't do enough Anatomy and, if you're going to be a surgeon, then you really need to know. And if you

want to do research, you don't have the basic sciences to actually understand the underlying processes ...'

9.5.2 Comments made by interviewees in the traditional course

The unstructured comments offered by the students in the traditional course tended to be briefer. On the whole, they were less strongly positive than those of the PBL students and had few common strands running through them.

Only one of the interviewees in this group mentioned enjoyment specifically, and even then with some qualification:

'I think that the first year has been quite stressful but, at the end of the day, I have enjoyed it.'

One student volunteered that she liked lectures but would have welcomed the opportunity to have had lectures in smaller groups, a situation in which she would then have felt more able to be an active participant and more at ease in asking questions:

'... we have a huge class in a lecture – we hardly get to know people, to actually discuss things and air our views. I am not the kind of

person, if I didn't understand something, I would put up my hand in front of 200 people and say, "Excuse me ..." If it were in a smaller class, it would be much easier, you would feel more involved in the learning instead of just an observer.'

The student who had already completed a degree abroad compared the lot of the medical student quite favourably with students in other undergraduate courses, at least in terms of the forms of assessment they encountered:

'I think they [medical students] get it easier than a lot of people, like Arts students having to do essays. There is no way I would do it. Far more stress if I was doing that because I know I procrastinate when it comes to essays – the only way I can do anything like write an essay is last minute.'

One student commented on the multi-faceted nature of learning and studying, involving the gathering, understanding and application of knowledge, and wished that she had recognised these different facets earlier in her undergraduate career.

The subject of exams was also mentioned by two or three students in the traditional

course, one of whom was 'just getting sick of them or ...more tired of them', while another would have welcomed some feedback on exam papers:

'... when we get the exam papers, there are no markings on them, nothing. You have then got to go and find someone and ask them. I think if they are bothering enough to put a mark down, they could say, in just one sentence, where you could do better.'

A third student also referred to exams but this was in the context of the problems that medical students might have in integrating with other students because they are a readily identifiable, self-contained group and because generally the medical students were still studying for exams at the very end of the session while the rest of the students in other courses had all finished their exams by that stage.

Finally, one student who, although very positive about the course, had found it something of a struggle for various reasons, had decided that, at some stage in the future, she would indulge her other academic interest in English Literature:

'I would love to write a book, probably will do it one day. I would write a book about the truth about being a medical student. No-one really told me what it would be like. I will do it after I leave university!' Mothers say the baby books you read ... never tell you how awful it is going to be. They never say your baby will bite

people and be sick in your car. No baby book has ever been written like that and neither has any medical student book. If someone wrote about people sitting in the Western till three in the morning, I would love it!

9.5.3 Summary of interviewees' unstructured final comments

In the main, the comments volunteered by the interviewees in the PBL course represented positive reactions to their course and their experience as medical undergraduates. Particularly striking was the high proportion of students who said, unprompted, that they had enjoyed the course, with special mention made of the hospital visits and patient contact. Concerns that they voiced included the lack of exams during the academic session, insufficient lectures directly related to coursework, the amount of staff support or guidance that was available, and the capability of the PBL course to train its students for a range of careers in medicine.

The comments of the interviewees in the traditional course tended to be less positive and it was difficult to categorise them in any way. Positive observations by individual students referred to enjoyment of the course, the lecture as a method of teaching (although smaller lecture groups would have been appreciated), and relief that medical students, unlike students in other courses, did not have to write a considerable number of essays. The more negative comments were targeted at exams, including the timing of final exams, as had been the case with the PBL interviewees, but, in

contrast with the latter, the interviewees in the traditional course referred to the frequency of exams in their course and the lack of written feedback on exam papers.

CHAPTER 10

RELIABILITY AND VALIDITY OF THE LEARNING PERCEPTIONS QUESTIONNAIRE

10.1 Introduction

Harvey (1994) examined the internal consistency of the 'Perry' questionnaire that she had devised for the purposes of her study of the development of higher-level cognitive skills in undergraduate Biology students. She concluded that there was evidence of a degree of consistency for the 18 Likert-type statements in the questionnaire. Since her questionnaire was amended in order to adapt it for the current study, it was thought necessary to consider the reliability and validity of the amended form (Appendix 1).

Reliability was investigated by looking at the internal consistency of students' responses within the series of 15 Likert-type statements (Term 1 Questionnaire: Section C). In terms of validity, it was thought that the consistency of students' responses to the four sentence stems (Term 1 Questionnaire: Section B1) and the 15 Likert-type statements would provide an indication of concurrent validity, since these two Sections were each designed to be measures of students' 'A', 'B' or 'C' positions.

It was decided to base these analyses of reliability and validity on students' responses to the learning perceptions questionnaire by focusing on the answers of all respondents, in the traditional and PBL courses combined, to the Term 1 questionnaire. The significant positive correlation between *openness to experience* and 'C'-ness (based on 'distance from A' scores in the Term 3 questionnaire) that has already been reported in Chapter 7 provides another measure of concurrent validity for the learning perceptions questionnaire.

10.2 Likert-type statements: consistency of students' responses to 'A', 'B' and 'C' types of statements

In Chapter 7, the construction of a 'distance from A' score was described. It had been found necessary to devise this score in order to correlate the data derived from the learning perceptions questionnaire with scores obtained from the five personality dimensions in the *NEO-FFI*. The calculation of the 'distance from A' score in Chapter 7 was based on the following logic:

1. A student who *agreed* with an 'A' statement was likely to *disagree* with a 'C' statement and *vice versa*.
2. A student who *agreed* with a 'B' statement was likely to be closer to an 'A' than a 'C' position on the 'distance from A' scale.

3. A student who *disagreed* with a 'B' statement was likely to be closer to a 'C' than an 'A' position on the 'distance from A scale'.

The conclusions in 2 and 3 above were drawn after a panel of three judges had examined the content of each of the five 'B' statements and considered it in terms of the likely meaning of agreeing or disagreeing with it in relation to 'A' and 'C' positions (Table 1, Chapter 2). The three judges had reached a consensus in respect of each one about whether agreement and disagreement should be located logically nearer an 'A' or a 'C' position.

The same logic was applied in considering the internal consistency of the 15 Likert-type statements. If there was a degree of internal consistency among these statements, then one would expect that, on the basis of point 1 above, there would be a negative correlation between the ranked responses to 'A'-type statements and the responses to 'C'-type statements. 'Ranked responses' refers to the response scale for the statements, in which 5 = '*Strongly Agree*', 4 = '*Agree*', 3 = '*Neutral*', 2 = '*Disagree*', and 1 = '*Strongly Disagree*'. Secondly, one would expect that, on the basis of point 2 above, there would be a positive correlation between responses to 'A'-type statements and those to 'B'-type statements. Thirdly, on the basis of point 3 above, one would expect that there would be a negative correlation between responses to 'B'-type statements and those to 'C'-type statements.

Using Spearman's Rank Order Correlation Test, students' ranked responses to each of the five statements in each category of statement ('A', 'B' and 'C') were correlated with each other. Responses to 'A'-type statements were correlated with responses to 'C'-type statements, and then with responses to 'B'-type statements; and responses to 'B'-type statements were correlated with responses to 'C'-type statements. In each correlational analysis, the ranked responses of students in the traditional and PBL courses were combined to form one group. The results of the correlational analyses are shown in Tables 27-29. The number of students (N) is not shown for each correlational analysis but this ranged from 252 to 260 across analyses.

Table 27 Correlation coefficients of responses to 'A' and 'C' statements: all respondents in traditional and PBL courses

'A' statements	'C' statements				
	3	6	9	12	15
1	0.00	-0.05	-0.15*	-0.21***	-0.20***
4	-0.12+	-0.14*	-0.21***	-0.25***	-0.20***
7	-0.09	-0.18**	-0.16**	-0.25***	-0.14*
10	-0.06	-0.15*	-0.13*	-0.14*	-0.21***
13	-0.10	-0.08	-0.23***	-0.24***	0.15*

+ $p \leq 0.1$ * $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

Table 28 Correlation coefficients of responses to 'A' and 'B' statements: all respondents in traditional and PBL courses

'A' statements	'B' statements				
	2	5	8	11	14
1	0.00	0.20***	0.13*	0.03	0.15*
4	0.12+	0.21***	0.23***	0.11+	0.02
7	0.15*	0.26***	0.32***	0.04	0.06
10	0.00	0.19**	0.20**	0.03	-0.02
13	0.10	0.17**	0.21***	0.12*	-0.01

+ $p \leq 0.1$ * $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

Table 29 Correlation coefficients of responses to 'B' and 'C' statements: all respondents in traditional and PBL courses

'B' statements	'C' statements				
	3	6	9	12	15
2	-0.08	0.04	-0.10	-0.09	0.07
5	0.05	-0.09	-0.07	-0.06	-0.13*
8	-0.05	-0.02	-0.29***	-0.23***	-0.15*
11	-0.11+	-0.04	-0.22***	-0.09	0.02
14	-0.01	-0.02	-0.15*	-0.00	0.02

+ $p \leq 0.1$ * $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

As Table 27 shows, the strongest case for consistency among the 15 statements is in the relationship between responses to 'A' and 'C' statements. Although not all the correlation coefficients were statistically significant, the large majority were. Also, with one exception, those which were not significant were in the predicted negative direction. With reference to Table 28, which shows the relationship between responses to 'A' and 'B' statements, the prediction was that this would demonstrate positive correlations. The majority of the correlations were significant and all but two

correlations (out of the total in Table 28) were in the expected positive direction. Lastly, in Table 29, there were far fewer statistically significant correlations than in the other two Tables and a number of the correlations were low. However, all but five of the correlations were in the predicted negative direction.

Each of the Tables above consists of a total of 25 analyses. It should be noted that, at the 0.05 level of significance, one analysis per set of 20 can be expected to be found significant. One could expect, therefore, that, in each of the Tables above, one of the significant correlation coefficients was the result of chance. However, the analyses still suggested there was a degree of internal consistency among the 15 Likert-type statements, especially in relation to 'A' and 'C' statements and, to a lesser extent, with respect to 'A' and 'B' statements. The weakest relationship was that between 'B' and 'C' statements. Here, also, there is an indication of consistency but to a much smaller extent.

10.3 Sentence stems and Likert-type statements: consistency of students' responses

The different forms of response requested in these two Sections (B1 and C) in the questionnaire presented a difficulty when it came to determining the consistency of students' responses. Students responded to the series of 15 statements on a five-point scale, representing '*Strongly Agree*', '*Agree*', '*Neutral*', '*Disagree*' and '*Strongly*

Disagree'. Responses to the four sentence stems were in the form of a fixed-choice response to one of three statements provided to complete the sentence stem. The three choices were designed to represent 'A', 'B' and 'C' positions respectively. The responses of each student, therefore, to all four sentence stems formed various patterns, for instance, *BBCB*, *CCCA*, *CBCB*, etc. However, unless the pattern of responses over the four stems was very clear, for instance, *CCCC*, *BBBB*, or *AAAA*, it was impossible to determine what the various mixed responses actually represented, in terms of a student's 'A', 'B' or 'C' position.

It was thought that one means of looking at the consistency of responses in these two Sections of the questionnaire might be to identify students who, in the sentence stems, had shown clear response clusters, that is, *AAAA*, *BBBB* and *CCCC*, and then to compare the responses given by these three groups of students to each of the 15 Likert-type statements, with particular reference to how each group responded to 'A', 'B' and 'C' statements, respectively. However, when the frequencies of students who had endorsed 'A', 'B' and 'C' answers were obtained for each of the four sentence stems, it was clear that there would be too few students with the *AAAA* pattern to allow for viable analyses. Indeed, there were no students at all with an *AAAA* response pattern and only one student with a *BBBB* response pattern. Sixty-one students showed a *CCCC* response pattern.

While analyses based largely on the *CCCC* response cluster would give a limited indication of validity, it was still thought worthwhile to examine how those students with *CCCC* responses had responded to each of the 15 Likert-type statements and compare them with the rest of the students, i.e., those who had given a pattern of response other than *CCCC* to the four sentence stems. Chi-square analyses were carried out in this set of comparisons, the results of which are shown in Tables 30 to 44. The analyses of responses of the two groups of students to the Likert 'A' statements (Statements 1, 4, 7, 10, and 13 in the questionnaire) are shown in Tables 30-34; those relating to the Likert 'B' statements (Nos. 2, 5, 8, 11 and 14) are shown in Tables 35-39; and those relating to the Likert 'C' statements (Nos. 3, 6, 9, 12 and 15) are shown in Tables 40-44. All chi-square analyses were calculated on the raw data.

Table 30 Responses of students to sentence stems and Likert statement 1 ('A' statement)

<i>Response to Likert statement 1: (I think it is the responsibility of the lecturer to give me all the information I need to pass the exam.)</i>	Number of students with the following responses to four sentence stems:			
	<i>CCCC</i>		<i>All other patterns</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
<i>Strongly Agree / Agree</i>	20	33	106	54
<i>Neutral</i>	15	25	42	21
<i>Strongly Disagree / Disagree</i>	25	42	49	25
<i>Total</i>	60	100	197	100

$\chi^2 = 8.71, df = 2, p = 0.01$

Table 31 Responses of students to sentence stems and Likert statement 4 ('A' statement)

<i>Response to Likert statement 4: (There isn't any point in a course including things which will not be in the exam.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	2	3	20	10
<i>Neutral</i>	7	11	40	20
<i>Strongly Disagree / Disagree</i>	52	85	139	70
Total	61	99	199	100

$\chi^2 = 5.96, df = 2, p = 0.05$

Table 32 Responses of students to sentence stems and Likert statement 7 ('A' statement)

<i>Response to Likert statement 7: (It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	5	8	28	14
<i>Neutral</i>	7	11	45	22
<i>Strongly Disagree / Disagree</i>	49	80	125	63
Total	61	99	198	99

$\chi^2 = 6.29, df = 2, p = 0.04$

Table 33 Responses of students to sentence stems and Likert statement 10 ('A' statement)

<i>Response to Likert statement 10: (A good thing about learning medical sciences is the fact that everything is so clear-cut; either right or wrong.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	3	5	30	15
<i>Neutral</i>	8	13	51	26
<i>Strongly Disagree / Disagree</i>	50	82	115	59
Total	61	100	196	100

$\chi^2 = 11.21, df = 2, p = 0.00$

Table 34 Responses of students to sentence stems and Likert statement 13 ('A' statement)

<i>Response to Likert statement 13: (The only fair problems in a test are those which are exactly like those we have already encountered.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	4	7	25	13
<i>Neutral</i>	18	30	59	30
<i>Strongly Disagree / Disagree</i>	39	64	113	57
Total	61	101	197	100

$\chi^2 = 1.90, df = 2, p = 0.39$

The same trend of responses to 'A' statements is shown in the four analyses which demonstrated significant differences. In comparison with students who had a mixed set of responses to the sentence stems, a smaller proportion of those who gave four 'C's in response to the sentence stems agreed with 'A' statements and more of them disagreed with the statements. In relation to statement 13, the differences between the two sub-groups were not statistically significant and the 'all other patterns' group showed the same distribution of *agree/disagree/neutral* responses as the *CCCC* group.

For the most part, these results coincide with the prediction made above in Section 10.2 (point 1) that a student who *agreed* with an 'A' statement was likely to *disagree* with a 'C' statement and *vice versa* in the Likert-type statements. If this is extended to the comparison between responses to the Likert-type statements and the sentence stems, one would expect that more of the students who responded *CCCC* in the latter would tend to *disagree* with 'A' statements and fewer of them would *agree* with 'A' statements.

The next set of Tables (Tables 35-39) show the results of the analyses involving the 'B' statements.

Table 35 Responses of students to sentence stems and Likert statement 2 ('B' statement)

<i>Response to Likert statement 2: (Sometimes there seem to be so many ways of looking at the course that I feel confused about what is right and wrong.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	N	%	n	%
<i>Strongly Agree / Agree</i>	23	39	101	51
<i>Neutral</i>	24	41	58	29
<i>Strongly Disagree / Disagree</i>	12	20	39	20
Total	59	100	198	100

$\chi^2 = 3.22, df = 2, p = 0.20$

Table 36 Responses of students to sentence stems and Likert statement 5 ('B' statement)

<i>Response to Likert statement 5: (If I read something which doesn't agree with what I have been told in lectures, I prefer to stick with the lecturer's point of view.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	12	20	47	24
<i>Neutral</i>	17	28	66	33
<i>Strongly Disagree / Disagree</i>	32	52	86	43
Total	61	100	199	100

$\chi^2 = 1.61, df = 2, p = 0.45$

Table 37 Responses of students to sentence stems and Likert statement 8 ('B' statement)

<i>Response to Likert statement 8:</i> <i>(I feel uncomfortable when I am left to make up my own mind about a subject, not knowing how the lecturer feels.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	14	23	59	30
<i>Neutral</i>	11	18	46	23
<i>Strongly Disagree / Disagree</i>	36	59	93	47
Total	61	100	198	100

$$\chi^2 = 2.71, df = 2, p = 0.26$$

Table 38 Responses of students to sentence stems and Likert statement 11 ('B' statement)

<i>Response to Likert statement 11:</i> <i>(The worst thing about a vague assignment is that you don't know what the lecturer requires from you.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	47	78	161	81
<i>Neutral</i>	9	15	24	12
<i>Strongly Disagree / Disagree</i>	4	7	13	7
Total	60	100	198	100

$$\chi^2 = 0.35, df = 2, p = 0.84$$

Table 39 Responses of students to sentence stems and Likert statement 14 ('B' statement)

<i>Response to Likert statement 14: (I sometimes choose a topic or a way of answering an exam question which I know the lecturer likes.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	23	38	85	43
<i>Neutral</i>	23	38	69	35
<i>Strongly Disagree / Disagree</i>	15	25	43	22
Total	61	101	197	100

$$\chi^2 = 0.58, df = 2, p = 0.75$$

In the predictions about the Likert-type statements described in points 2 and 3 in Section 10.2, it was proposed (point 2) that a student who *agreed* with a 'B' statement was likely to be closer to an 'A' than a 'C' position on a 'distance from A' scale. It was also proposed (point 3) that a student who *disagreed* with a 'B' statement was likely to be closer to a 'C' than an 'A' position on a 'distance from A scale'. From these, one would expect that, in comparison with students who had other patterns of responses, those who had a *CCCC* cluster of responses in the sentence stems would tend to disagree with 'B' Likert statements.

This time the set of chi-square analyses revealed no significant differences between the two sub-groups of respondents to the sentence stems, and the predicted pattern of response – that *CCCC* students would disagree with 'B' statements - was observed in

only two of the five statements (statements 5 and 8). It is difficult to outline any clear general response to 'B' statements on the part of the CCCC students. Equally, a general pattern of the differences in response between the two sub-groups of students cannot be discerned from inspection of the Tables.

The third set of Tables refer to the chi-square analyses involving the Likert 'C' statements.

Table 40 Responses of students to sentence stems and Likert statement 3 ('C' statement)

<i>Response to Likert statement 3: (Sometimes I learn more about a subject by discussing with other students than I do by sitting and revising at home.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	46	75	144	72
<i>Neutral</i>	12	20	35	18
<i>Strongly Disagree / Disagree</i>	3	5	20	10
Total	61	100	199	100

$\chi^2 = 1.56, df = 2, p = 0.46$

Table 41 Responses of students to sentence stems and Likert statement 6 ('C' statement)

<i>Response to Likert statement 6: (If I had the choice of written comments or a mark at the end of a piece of coursework, I would choose the comments.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	33	54	100	52
<i>Neutral</i>	23	38	46	24
<i>Strongly Disagree / Disagree</i>	5	8	48	25
Total	61	100	194	101

$\chi^2 = 9.53, df = 2, p = 0.01$

Table 42 Responses of students to sentence stems and Likert statement 9 ('C' statement)

<i>Response to Likert statement 9: (I enjoy undertaking tasks where the lecturer doesn't specify exactly what has to be done and it is left to me to decide)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	10	16	39	20
<i>Neutral</i>	29	48	61	31
<i>Strongly Disagree / Disagree</i>	22	36	97	49
Total	61	100	197	100

$\chi^2 = 5.71, df = 2, p = 0.06$

Table 43 Responses of students to sentence stems and Likert statement 12 ('C' statement)

<i>Response to Likert statement 12: (I like exams which show me I have ideas of my own.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	45	74	105	53
<i>Neutral</i>	11	18	64	32
<i>Strongly Disagree / Disagree</i>	5	8	28	14
Total	61	100	197	99

$\chi^2 = 8.02, df = 2, p = 0.02$

Table 44 Responses of students to sentence stems and Likert statement 15 ('C' Statement)

<i>Response to Likert statement 15</i> <i>(It's good when a number of lecturers are teaching a course because you get not just one but a variety of opinions.)</i>	Number of students with the following responses to four sentence stems:			
	CCCC		All other patterns	
	n	%	n	%
<i>Strongly Agree / Agree</i>	54	90	160	81
<i>Neutral</i>	5	8	18	9
<i>Strongly Disagree / Disagree</i>	1	2	19	10
Total	60	100	197	100

$\chi^2 = 4.22, df = 2, p = 0.12$

Following through the earlier predictions about the relationship between responses to the Likert-type statements and the sentence stems, one would expect that those students who responded to the sentence stems with *CCCC* would have a tendency to agree with 'C' Likert statements. In the case of two of the significant chi-square analyses (referring to statements 6 and 12), the pattern of responses was generally in line with that prediction. Compared with 'all other' respondents, proportionately fewer of the *CCCC* group of students disagreed with statement 6 and more agreed with statement 12. Also, the two chi-square analyses which showed no significant differences (statements 3 and 15) between the two sub-groups of students still showed the predicted trend to a small extent. Statement 9, which showed significant

differences, not at the .05 level, but at the .10 level reflected a slightly different pattern of responses – compared with ‘all other’ respondents, a smaller proportion of the ‘CCCC’ respondents disagreed with the statement and also slightly fewer agreed with it but more of them, approximately a half, endorsed a neutral position.

Overall, this series of analyses provided some evidence of consistency between very broad groupings of responses to the sentence stems in Section B1 of the Term 1 questionnaire and the responses to the 15 Likert-type statements in Section C of the questionnaire. The evidence was strongest in relation to the ‘A’ Likert statements and, to a lesser extent, the ‘C’ statements. The weakest relationship, showing no evidence of the predicted trend, was between the sentence stem responses and the ‘B’ statements.

10.4 Summary

There did seem to be evidence for a measure of internal consistency within the set of 15 Likert-type questions in Section C of the Term 1 questionnaire, according to predictions about the relationships among responses to ‘A’, ‘B’ and ‘C’ statements. This was derived especially from the relationship between ‘A’ and ‘C’ statements and, to a lesser degree, ‘A’ and ‘B’ statements. The relationship between ‘B’ and ‘C’ statements was less clearly established, although the predicted general trend could be outlined.

Examining the validity of the questionnaire was constrained by the nature of responses required in different Sections of the questionnaire. There was some evidence for concurrent validity between two very broad groupings of responses to the sentence stems in Section B1 (in the Term 1 questionnaire) and responses to the 15 Likert-type questions, again more so in relation to the 'A' and 'C' Likert statements but largely absent in respect of the 'B' Likert statements.

It must be noted that the analyses of validity were limited, focusing as they did on a comparison between the four *CCCC* responses and 'all others' in the sentence stems, and showing that, at best, students reporting a strong 'C' position in the sentence stems gave responses of a consistent type in the Likert-type statements. This, however, can provide little information about the precise relationship between the series of 15 Likert-type statements and the collection of combined responses in the 'all other' category. There remains the difficulty of interpreting, in a meaningful way, mixed clusters of response to the sentence stems, e.g., *BCBC*, *BCCA*, together with the relative infrequency of 'A' (and to a lesser degree 'B') responses to three of the sentence stems – the student's role, the lecturer's role and the nature of knowledge. Given these factors, it is probably not possible to establish any more clearly the validity of the sentence stem responses in relation to the Likert-type statements, unless responses to each of the four sentence stems were to be compared with responses to each of the 15 Likert-type statements.

SUMMARY OF RESEARCH RESULTS

11.1 Introduction

Prior to a discussion of the results, it should be helpful to summarise the results obtained from analyses of the questionnaire on perceptions of learning, the personality inventory and the interviews.

11.2 Perceptions of learning reported by students in the traditional and problem-based courses

11.2.1 Differences between the two cohorts of students at each of three points in time: i) pre-university ii) beginning of first year iii) end of first year

Traditional Cohort	PBL Cohort
<i>'Pre-university'</i>	<i>comparison</i>
<i>Beginning of</i>	<i>Year 1 comparison</i>
<i>End of Year 1</i>	<i>comparison</i>

In the analyses reported in this section, no account is being taken of the extent to which *individual* students changed or did not change over time. (Such analyses of changes in individuals' responses are described in Section 11.2.3 below.) The results described here focus on comparing *overall group patterns* at specific points in time.

- Students in both the traditional and the problem-based course would seem to have started from a similar pre-university baseline, in terms of the views they reported about four important elements of their undergraduate learning environment. When asked to reflect back to the period before coming to university and to gauge what they thought their views about teaching and learning had been at that stage, students in both courses reported similar types ('A', 'B' or 'C') of perceptions in relation to each of the four elements: the role of the student, where there was a fairly even spread of views across 'A', 'B' and 'C' positions; the role of the lecturer or member of staff, which also showed a fairly even spread across these three positions; the nature of knowledge, where there was some polarisation of views associated with a 'C' position; and the student's task in examinations and assessments where there was some polarisation of views, associated, in this instance, with an 'A' position.

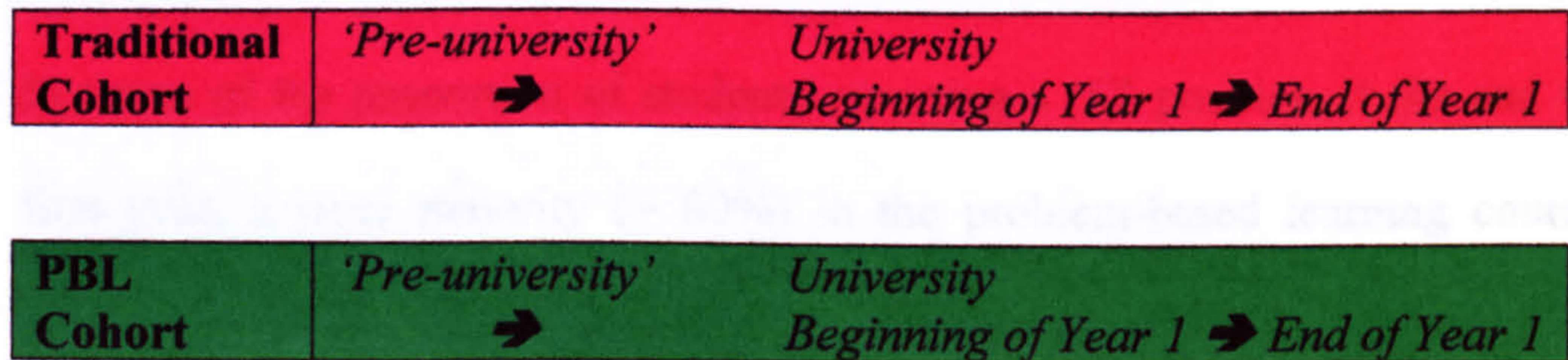
- However, even as early as halfway through the first term of the first year of undergraduate study, there was evidence that the students in the two courses differed significantly in the distributions of 'A', 'B' and 'C'-type perceptions of *three* of the four elements: the roles of the student and of staff members and the

student's task in the examination/assessment situation. At the end of their first year, the perceptions reported by the groups of students in the two courses differed significantly in relation to *all four* elements. More specifically, in two of these elements, the roles of the student and of staff members, the differences were highly significant at this stage of the course (Table 6).

- As well as these significant differences between the two groups by the end of first year, more than half of the students in each course reported 'C' perspectives in relation to the nature of knowledge and the roles of student and staff (Table 7), perspectives that are thought to characterise a critical, independent approach to learning. In addition, this trend was much more marked in the case of students in the problem-based learning curriculum, especially in terms of how they saw their own role as students and that of members of staff.

The largest disparity between the two cohorts of students emerged in relation to their views about exams and assessments. 60% of PBL students but fewer than a quarter of those in the traditional course saw assessment situations as 'open-ended', that is, allowing scope for students to show evidence of their own thinking and to draw on what they have learned from various sources as well as from staff.

11.2.2 Separate within-group comparisons across time (pre-university, beginning of Year 1, end of Year 1) based on i) students in the traditional course and ii) students in the problem-based learning course



In addition to contrasting the ‘whole group’ responses of the two student cohorts at the pre-university stage and at the beginning and end of first year, the traditional and PBL groups were considered separately in order to trace any trends in changes in perceptions over time within each group, in relation to the same four elements. It is important to note again that the comparisons were being drawn on the basis of the overall *group* trend in each cohort of students at each point in time. They do not represent a tracking of changes over time in the perceptions of *individual* students.

- At the beginning of first year (specifically, the middle of first term), more students in both courses reported ‘C’-type views, compared with those who retrospectively reported ‘C’ perspectives pre-university. However, patterns of change from first to third term were less consistent. The group in the traditional course seemed to move backwards slightly, from a ‘C’ position, from first term to third term in their perceptions of all but the student’s role,

where there was evidence of a slight movement forwards. In contrast, the PBL group showed a slight shift backwards here and also in views about the nature of knowledge but moved forwards vis-à-vis the student's task in exam/assessment situations. The group's views about the role of staff remained similar in first and third terms.

- In terms of the proportion of students reporting a 'C' position at the end of first year, a large majority (> 80%) in the problem-based learning course seemed to hold such views, especially in regard to the roles of staff and student (Table 7).

- Although, in the case of students in the traditional course, the comparable percentages in every one of the four areas of the learning environment were considerably smaller, 'C' positions characterised more than half of this group in three of the four areas. As stated above, it was the assessment/exam-related element which stood apart from the other three and here the percentage of students in the traditional course who reported a 'C'-type approach was especially low (22%) (Table 7).

11.2.3 Patterns of change in individuals' perceptions during first year in the traditional and PBL courses

Traditional Individual	<i>University Beginning of Year 1 → End of Year 1</i>
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PBL Individual	<i>University Beginning of Year 1 → End of Year 1</i>
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- For the majority of students in both courses, the end-of-year 'C' positions vis-à-vis the student's role, the role of staff, and the nature of knowledge did not reflect a *change* to 'C' during the academic year but a continuation of the position originally reported near the beginning of first year (Table 8). Only a relatively small percentage of students in each course seemed to change towards 'C' as they progressed through the academic session. In the exam/assessment area, in contrast, the proportion of students in each cohort that maintained a 'C' position was very similar to the proportion that moved to 'C'.
- Only small percentages of the problem-based learning students reported a 'backwards' change, generally from 'C' to 'B' positions, in any of the four areas (Table 10) while comparatively more of the students in the traditional course appeared to change in this direction (Table 9). Looking specifically at exam/assessment-related perceptions, firstly, where there was 'backwards'

movement, this tended to be characterised by a return to an 'A' position for the traditional students. For the relatively few PBL students who moved 'backwards' in this area, they moved equally to 'A' and 'B' positions. Secondly, a surprisingly large percentage in each course (29%, PBL course; 23%, traditional course) reported a change 'forwards' in this aspect of their learning experience. For the PBL students, this movement was mostly towards a 'C' position, while only just over half of the traditional students moved to 'C'.

- Highly significant differences between the students in the traditional and problem-based courses were found in the pattern of changes in individuals' perceptions of the general role of the student and of what was expected of them in exam/assessment settings. Their views about the nature of knowledge also differed significantly. It was not possible to carry out a similar statistical analysis of the data which referred to views about the role of staff but inspection of this data showed change responses similar to those found for the student role and knowledge.

- In each of these four areas, the direction of the differences in views of the two cohorts was in line with what might be expected, given the characteristic features associated with, on one hand, a problem-based learning curriculum and, on the other, a traditional, lecture-based programme. A higher percentage of students in the PBL course than in the traditional course reported holding 'C'-type perceptions at the beginning *and* end of their first year in medicine. This applied

even to the exam/assessment area, which tended to reflect different patterns of response in both cohorts in most of the analyses. In this area, in addition, the relatively higher proportion of students in the traditional course who reported an 'A' position at the beginning of the year and held it until the end of the year was marked.

- In general, relatively more of the students in the traditional course, compared with those in the PBL course, reported changes in their views which could be interpreted as representing a 'backward' movement during first year. This change 'backwards' on the part of students in the traditional course was mostly towards 'B' in terms of the role of staff and knowledge but, in the case of exams/assessments, the move 'backwards' was largely towards an 'A' position.

- There was evidence of what could be described as change 'forwards' in both cohorts. Relatively more of the students in the traditional course reported such a change in perception of the rôle of student, although it has to be noted that, since a considerable percentage of the students in the PBL course started and finished first year with a 'C'-type perspective in this respect, clearly fewer of them could report such a move forwards. Secondly, as referred to above, a fair proportion of students in both courses reported a change 'forwards' in the exam/assessment area, although there were differences between students in the two courses in terms of extent of that change - movement towards 'C' accounted for almost all of the PBL students but only just over half of the students in the traditional course.

- More specifically, in terms of 'C'-type responses, significantly more of the students in the problem-based course favoured assessments which allowed them to demonstrate their own ideas and preferred written comments on coursework rather than simply a mark (Table 13). Also significantly more of the PBL students were not in favour of a course which included only topics on which they would be assessed. They did not see it as a waste of time to work on problems which have ambiguous solutions nor did they agree with the suggestion that medicine is a good area to study because its subject matter is clear-cut. In contrast, significantly more of the students in the traditional course thought it was the responsibility of staff to provide students with all the information they required to pass the course, an 'A'-type stance (Table 11).

- However, in one or two aspects, the direction of the differences between students in the two courses suggested greater uncertainty and lack of confidence amongst students in the PBL course. There was some evidence that this uncertainty not only was maintained during first year but also had increased by the end of it. For example, significantly more PBL students thought that sometimes there seemed to be so many ways of looking at the course subject matter they felt confused about what was right and wrong. Also, by the end of their first year, a significantly higher percentage of the PBL students (71%, compared with 27% of those in the traditional course) had changed their original response to this aspect and instead, agreed that, if they discovered conflicting views on a topic, they liked to know which view was the 'right one' (Table 15).

11.3 Data from individual interviews

- Traditional and PBL interviewees reported different levels of, and variations in, motivation since starting the course. A few of the former thought their motivation had increased but it had decreased for about half of them. This had been expected, and was seen to be associated with the pre-clinical years. In contrast, almost all the PBL interviewees thought that their motivation had increased from already high levels at the beginning of their university course. Shared by interviewees in both courses was the link they perceived between high motivation and clinical experiences, especially patient contact.

- PBL interviewees reported meeting a wide range of reactions to their medical course, varying from mixed views from hospital staff to entirely negative ones from other students in related courses. This seemed to have acted as a spur to most of them to have a positive approach to their course.

- Most PBL interviewees had been aware, prior to starting, that the Glasgow medical course had been altered in some ways but were vague about, and unprepared for, the precise nature of the changes, assuming simply that there would be earlier clinical experience with less time spent in lectures and more in tutorials/seminars.

- Generally, the traditional interviewees had been reasonably confident of passing their first two years of the course, based on their previous educational success, initially in school, and then in their first year in medicine. In comparison, confidence levels among the PBL interviewees seemed more variable over the first two years, with initial confidence, in first year, apparently lower than that of the traditional students. About half of the PBL interviewees continued to be quite confident about passing their second year but others reported their confidence falling after the beginning of second year. Interviewees in both courses were generally more optimistic about eventually completing the medical course, although one or two rarely thought about final year at this stage.

- There was some overlap in the areas of difficulty mentioned by interviewees in the two courses. Both groups highlighted exams but for different reasons, the traditional students feeling overburdened with the number of exams per year, and a few of the PBL students feeling deprived of exams during the year with an attendant lack of feedback on progress and relevant exam practice. The PBL students also found it difficult to identify the 'essential' course content and to judge the appropriate breadth and depth of knowledge required, more specifically to pass the 'professionals'.

Both groups also referred to volume of work as a source of difficulty but one which had been anticipated. However, the students' actual experience of the

workload in the two courses differed. The PBL students found the first year workload far lighter than expected while second year had increased sharply in comparison. Many wished for more staff guidance on what was expected of students in the PBL curriculum. The views given by the traditional students covered a wider spectrum, from those who found it almost overwhelming, to those who considered it heavy but adopted certain attitudes towards it or changed their strategies of working in order to cope with it, to those, generally with broader pre-course experience and different cultural backgrounds, who had expected an even greater workload. Regardless of the match between expectation and actual experience, many interviewees in both courses stressed that it was the sheer volume of the work that presented a problem, not its level of difficulty.

- In comparison with those in the traditional course, the PBL interviewees tended to think of their course as being characterised by features requiring higher level thinking (e.g., independent thinking), management of information (e.g., gathering and analysing information), and, to a lesser degree, by stimulation and enjoyment, and being stimulated to learn more. The traditional students saw their course as being characterised by the learning of details.

- One of the main differences between the two groups of interviewees was the degree to which they reported changing their approaches to studying from school to university and even, in one or two instances, from first to second year at university. Generally, the PBL students reported that they had continued to use

their school/college approaches to studying, which seemed to consist of active and imaginative ways of working (e.g., mind maps, pictures) based on the understanding of content rather than on learning by rote. One or two, though, reported having to sacrifice understanding for memorising for the purpose of speed.

Almost all traditional interviewees reported changing their approaches to studying in order to cope with the much greater volume and diversity of undergraduate study. It was often difficult to clarify the nature of these changes. Some referred simply to starting revision earlier in the term or memorising more, a few had evolved an understanding of the approaches that seemed to suit them, and others adopted a strategic approach based on previous exam papers.

- Many interviewees made the point that they used different approaches to studying in different subjects, depending on what they perceived as the demands of the subject and staff. In terms of the reported frequency of use of the twenty-two listed approaches, there were more similarities than differences between traditional and PBL students. Some differences emerged in the frequency with which seven of the approaches were used, most of the seven approaches being used less often by students in the traditional course. These referred to aspects such as writing down and adhering to a revision schedule, selecting specific areas for revision, summarising notes on specific topics, and organising topics around themes or main ideas. The PBL students, however, used their co-students more frequently than did the traditional students to discuss course material and any problems that arose.

- In general discussion during the interviews about methods of studying, 're-writing of notes' was a recurring theme with both groups of interviewees. Usually this method was not as superficial as it might appear. For the traditional students, it involved using textbooks and occasionally other resources to expand on lecture material, with particular attention paid to areas that had been less well understood. Likewise the PBL students elaborated their course notes using textbooks, possibly two or three per subject.

- At the end of the interview, in response to an open-ended question about learning experience, a high proportion of the PBL students commented on their enjoyment of the course, especially the hospital visits and patient contact. They reiterated concerns about the lack of exams during the academic session, insufficient lectures directly related to coursework, the amount of staff support/guidance that was available, and the capability of the PBL course to train its students for a range of careers in medicine.

Comments from the traditional interviewees were less positive generally and difficult to categorise. Positive observations by individuals referred to enjoyment of the course, the lecture as a method of teaching, and appreciation of not having to write numerous essays in a course such as medicine. The more negative comments repeated those previously mentioned, such as exams, including the

timing of final exams, as had been the case with the PBL interviewees, but, in contrast with the latter, the interviewees in the traditional course referred to the frequency of exams in their course and the lack of written feedback on exam papers.

11.4 Correlations between students' perceptions of learning and personality traits

- For students in both courses, there was a highly significant positive correlation between their 'distance from A' scores at the end of first year (in the third term) and their scores on the personality variable, *openness to experience* (Table 24). This suggested that 'C'-type perceptions were related to being open to experience, a trait that is thought to reflect intellectual curiosity, independence of judgement, and a willingness to question authority. Conversely, 'A'-type views were thought to be related to low scores on this personality dimension, in other words, to conventional behaviour, a conservative outlook, and a preference for the familiar rather than the novel.
- In the case of female students in the traditional course and both male and female students in the PBL course, there was a significant positive correlation between 'distance from A' scores at the end of first year and the personality dimension of *agreeableness*, suggesting a link between 'C'-type perceptions of learning and altruism, sympathy for others and an eagerness to help others. For male students

in the traditional course, no significant relationship was found between these two sets of scores (Table 24).

- No significant associations were found between end-of-year 'distance from A' scores and the personality dimensions of *conscientiousness*, *extraversion*, or *neuroticism* for any of the students (Table 24).

CHAPTER 12

DISCUSSION OF RESEARCH RESULTS

12.1 Introduction

Three main areas for discussion emerge from the results of the study. These relate to *i)* differences in learning perceptions between students in the problem-based learning course and the traditional course that were evident in the middle of Term 1 in first year and were even more marked at the end of first year; *ii)* the patterns of perceptions about exams/assessments that emerged in *both* groups of students, distinguishing this element of students' learning experience from other elements, such as perceptions of the student's role or of the role of staff; *iii)* the positive correlations that were found between 'C'-ness (or 'distance from A') and the dimensions of personality, *openness to experience* and *agreeableness*, in *both* groups of students.

Much of the discussion in this Chapter is organised under these three headings. The Chapter ends with a consideration of the claims that can be made on the basis of the study, prior to a summary of conclusions that can be drawn.

First, though, there is a brief discussion of some general reactions reported by students to their learning environment, drawing largely on data from the interviews and 'unstructured' comments sheets in the Term 3 learning perceptions questionnaire and their links with other research findings.

12.2 Students' general reactions to their learning environment

The relatively small number of studies that exist in this area have demonstrated consistently that students in PBL courses generally report that they have enjoyed the learning experience and have found it interesting (e.g., Albanese and Mitchell, 1993). This would seem to provide some support for Barrows' (1986) argument that one of the main objectives of PBL in medical education is to enhance the students' intrinsic motivation to learn. As with the 'traditional' students in the study by Block *et al* (1990), some of those in the traditional course in the current study also described their pre-clinical study as 'boring' and questioned its relevance to their future professional practice. One student clearly felt strongly about this and commented at length in the Term 3 questionnaire:

'... Clinical matters should be taught from day 1. We are going to be doctors, not anything else, and the main things relevant to us are not taught until 3rd, 4th and 5th years. I can understand why we have to learn various aspects of Anatomy, Physiology, Biochemistry, etc,

however some of the course is very poorly taught and very difficult. Much of the irrelevant stuff has to be known, however, *before* we can even begin our clinical learning – something which I find very unfair. We are having so many difficult and comparatively irrelevant things which we HAVE to know being thrown at us. Most doctors probably can't even remember any of the Biochemistry they studied at university – why should we?'

In sharp contrast, a striking feature of the PBL interviewees was the extent to which they volunteered comments about how much they were enjoying the course, especially the contact with patients, finding it very relevant to what they expected in medical practice after graduation and, therefore, highly motivating. One wonders whether the traditional students might also have found their pre-clinical years more enjoyable, relevant and motivating if patient contact had been built into their course in a substantial way, had it been possible to do so.

In another respect, there was considerable similarity between the perceptions of students in the two courses at Glasgow and those reported in research studies elsewhere. This concerned the extent to which traditional and PBL students saw their courses as being characterised by a number of key features, related to higher-level thinking (e.g., independent thinking, understanding and applying principles), the management of information (i.e., collection and analysis of information), stimulation of self-directed learning (i.e., to learn and read more), the learning of details and

overall satisfaction with the course. The current study, like those by Mårtenson *et al* (1992) and Kaufman and Mann (1996a), also found that the PBL interviewees, more so than the traditional students, thought that their course was characterised by the following: independent thinking, the understanding and application of principles, the integration of subjects to solve problems, making decisions, the collection and analysis of information, problem-solving, stimulation to learn more, and was stimulating and enjoyable. Also, the learning of details was the single feature which the traditional students rated as typical of their course.

Even though the number of interviewees was relatively small, the differences between the two groups of students, shown in the appropriate bar charts in Chapter 9 (Figures 42-51), are sufficiently clear to suggest that they are unlikely to be the result of chance factors. These findings suggested that important features associated with a PBL course format had been successfully incorporated into the Glasgow course and were identifiable by the students.

12.3 Perceptions of their learning experience reported by students in the two curricula

The views reported by the two cohorts of students about their learning experience during first year showed many significant differences. Generally these were in a consistent direction and of a kind that might be hoped for in a problem-based

approach to learning, as described in the final column of Table 1 (Chapter 2). That is, there is evidence of attitudes being reported, to a greater extent, by PBL students that are likely to reflect a critical, self-directed student, a learner who is willing to evaluate information and who wants scope to demonstrate his/her understanding of the complexities of a field of study, a student who would seem to be in a 'C' position within the adapted Perry scheme. The evidence from both sections of the learning perceptions questionnaire – the sentence stems and the series of Likert-type statements – pointed in this direction.

With the finding that a greater proportion of the PBL students reported views reflecting a 'C' position at the end of their first year, the major question that arises is whether this was a direct result of the PBL format. It is impossible to say with certainty what has produced the differences between the two groups, given the likelihood of a range of *individual* differences, even in this highly selected student group. These comprise intrinsic factors, such as motivation to study medicine, personality, confidence, and academic ability, and extrinsic factors which are likely to impinge on students in their first undergraduate year, for example, the novelty of undergraduate study, the transition from school or college, the possibility of living away from home. The design of the research does not allow conclusions about cause-and-effect to be drawn. However, statistically significant perceptions were found to be associated with students enrolled in the two different courses.

It could be argued that the traditional and PBL students began first year from different starting-points, in other words, that more of the PBL students held a 'C' perspective

before they even began their first undergraduate year and that this is the essence of the significant differences found between the two cohorts in Terms 1 and 3. However, the retrospective evaluations of how students had viewed learning prior to coming to university gave support to the idea that the two cohorts had started from essentially similar baselines near the beginning of first year. Even if students' recollections of their pre-university study were faulty, it seems unlikely that these recollections would be so consistently faulty across both cohorts as to produce no significant differences between them.

In addition, the admission requirements for the first year of the new PBL course had not been changed but remained as they had been for the last intake to the traditional curriculum (verbal communication, Associate Dean, Faculty of Medicine, January 1999). Therefore, the same admission criteria, based on academic qualifications and interview, had been applied to students in both cohorts, also lending support to the apparent initial similarity of the two groups of students.

Another aspect of the argument, that the PBL and traditional students differed when they began university, concerns the effect that prior knowledge about the forthcoming changes in the medical course might have had on applicants. In other words, advance information about the course might have attracted potential students, more of whom were already at a 'C' position. The interviews with the PBL students suggested that this was not a strong possibility, in the light of the students' vagueness, prior to beginning university, about what PBL was going to entail, even amongst those one or

two who had chosen the Glasgow course *because* of the changes. The most common reaction reported by the interviewees to questions concerning prior information about the course was that they had been unprepared for the radically different way of working they had encountered in the PBL format.

Many of the interviewees thought that the 'group work' involved in the course would be similar to the tutorial or seminar groups of the kind they had known in sixth year at school, which many had enjoyed, and it is possible that the willingness to engage in discussion groups reflects characteristics associated with a 'C' stance which had also encouraged them to apply for the new PBL course. However, involvement in, and enjoyment of, tutorial groups in sixth year at school would not have distinguished students in the PBL and traditional courses, since interviewees in the latter course also referred in a positive way to the small teaching groups they had experienced at school.

Clearly the ideal research design for establishing a baseline for the perceptions of the two cohorts would have incorporated the gathering of data on students' views about their pre-university learning experience while they were still at school or college. Although such a design would have been sounder in methodological terms, it was less feasible in practical terms. It would have been necessary to contact by post (in the UK and abroad) all those who accepted places, in order to request their participation in the research and then also to carry out the initial stages of the research by post. In these circumstances, it is likely that the response rates for the questionnaires would have been lower than those obtained by a personal request in class settings. Also, the

researcher did not become involved in the research project until about a month prior to the beginning of the university year in which there would be the last intake to the traditional curriculum. For these practical reasons, therefore, it would have been difficult to have implemented the ideal design for determining the students' pre-university perceptions.

Given this limitation of the research design, it is impossible to claim that the two cohorts of students definitely *did* start from a similar baseline in their pre-university perceptions. However, it seems likely, for the reasons discussed above, that they were more similar than dissimilar. At least, the students were similar in the perceptions they *thought* they had had before they came to university.

In order to establish a baseline for perceptions at the beginning of first year, the intention was to distribute the first questionnaire at a time which would allow for the students' settling-in period at university but before they had begun to adapt completely to their new learning environment. It seemed appropriate to administer the first questionnaire about learning perceptions after the new academic session had been running for about four weeks, at the mid-point of the first term. At this early stage in the academic year, therefore, it was surprising to find the significant differences between the two cohorts that did emerge.

Obviously the PBL students had, by this point in the first term, become aware of what the PBL format was like in practice, they had observed how staff behaved in this

learning environment and they were learning how they, as students, were expected to behave within it, all of which was very different from their school experience of working in group settings. It is likely that the transition from school to university, especially during the first few weeks of the first year, has an impact on most undergraduates and, indeed, at this point in the first term more students in both courses endorsed a 'C' stance than had done so in the retrospective pre-university reports. It is possible that their encounter with a course that was so different from what they seem to have expected (according to the interview data) had had an even stronger impact on the PBL students than on the traditional ones – fortunately in the directions desired within the setting of this kind of course.

When the learning perceptions questionnaire was distributed, it was stressed to students that there were no 'right' or 'wrong' responses. It is quite likely that some students gave what they thought were the desired answers, to reflect what might seem to them to be the 'ideal' student. It is difficult to gauge the true extent to which students did respond in this way, but there is little reason to assume that one of the groups would have been influenced to a greater extent than the other. Drawing on the number of interviewees who referred directly to having answered 'ideally' and the number of students who commented on the questionnaire itself (in the 'unstructured' comments sheet inserted in the Term 3 questionnaire), it seemed that it might be the case that a very small proportion of respondents had given what they thought were the 'ideal' answers. Indeed, in the interviews, one PBL and one traditional student confessed to answering the sentence stem about exams/assessments in the way they

thought was wanted by the researcher, that is, endorsing a 'C' choice, in the Term 1 and Term 3 questionnaire respectively. In the 'unstructured comments' sheet enclosed in the Term 3 questionnaire, none of the PBL students commented on the content or structure of the questions themselves but two of the traditional students did so, one noting that:

'The questions [sentence stems] are structured very much on an "ideal student" answer plus two other options. As intelligent people, students may either tick this option, though it is not their opinion, or deliberately avoid it to annoy you!'

The other remarked that:

'I find a lot of the questions [in the questionnaire] misleading, therefore [we] put what we know is right but [it] may not be as we want to, or ... practise.'

'Ideal' responses were probably a stronger possibility with the sentence stems than the Likert-type statements. There were almost four times as many Likert statements as sentence stems and respondents probably had to work through them at a much faster pace, perhaps having less time to think about them as deeply. Also respondents were asked to give a ranked response (e.g., ranging from '*Strongly Agree*' to '*Strongly Disagree*') rather than make a forced choice among three possibles, and this might have

strengthened the impression that there were less likely to be 'right' or 'wrong' responses to the Likert statements.

If it is accepted that the features which characterise a 'C' stance represent those qualities that would be hoped for in new medical graduates, then it was an encouraging result to find that, at the end of their first year, more than half of the students in *each* course were reporting 'C' perspectives in how they viewed the nature of knowledge and the roles of student and staff. The trend was more pronounced in the case of the PBL students, especially in relation to their perceptions about student and staff roles. For example, a student in the PBL course elaborated on one of her responses in the learning perceptions questionnaire as follows:

'We are never told right and wrong. We are sent to find things out for ourselves. Dealing with patients is never clear-cut and we are being allowed to think for ourselves.'

When elaborating on their questionnaire responses, students in both courses whose responses seemed to reflect 'C' perspectives often mentioned, implicitly or explicitly, the importance of how decision-making should be set in context. Here, they referred to ethical issues, the importance of remembering that humans are complex beings,

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and the importance of recognising the existence of different treatments, not all of which might be appropriate for a given patient. One of the PBL students said:

‘Very few things in medicine are clear-cut: drugs have various side effects and many body mechanisms are not known. Ethics are certainly not clear-cut ... Few things in medicine are clear-cut, if you think about them.’

A student in the traditional course remarked that:

‘I think the scientific facts have to be put in the context of treating the patient. Often logic is not applicable and the human body requires individual assessment.’

In some ways, what was less encouraging perhaps was that the end-of-year ‘C’ positions reported by students in both courses represented, in the main, not a *movement to ‘C’* during first year, but a maintenance of the ‘C’ positions reported in the middle of Term 1, suggesting that, in each course, whatever movement to ‘C’ had taken place was associated with the first few weeks of the new academic session. This does not mean that there was no movement at all during first year on the part of *individual* students. There was evidence of change both ‘forwards’ and ‘backwards’ within each group of students but change ‘backwards’ was more closely associated

with the students in the traditional course, in relation to the role of staff, the nature of knowledge and what was expected of students in exams/assessments. Perceptions associated with exams/assessments will be discussed in detail in Section 12.3. Change 'backwards' among the traditional students in relation to staff roles and knowledge was mostly in the direction of C→B. The questionnaire excerpts given below from these students illustrate the movement.

Students were asked to indicate their agreement or disagreement with two statements but also to justify their answer (Section D in Term 1 Questionnaire, Section C in Term 3 Questionnaire). The statements had been extracted from the series of 15 Likert-type statements in the learning perceptions questionnaire. In retrospect, both statements could have been designed more skilfully, to avoid the ambiguity inherent in each. Both statements, as they stand, contain *two* elements with which the respondent could agree or disagree. However, in most instances, the justifications given by the students clarified how they had interpreted the statements.

Statement: *There sometimes seem to be so many ways of looking at scientific subjects, I feel confused about what is right and wrong.*

One student gave the following responses to the above statement in Terms 1 and 3, which could be interpreted as a change from a 'C'-type response in Term 1 to a 'B'-type response in Term 3.

Term 1: 'Disagree: Sometimes there is no right answer and discussing all the possibilities is interesting.'

Term 3: 'Agree: Different views given by lecturer, textbooks can really confuse me.'

Similarly, another student gave the following answers to the same statement:

Term 1: 'Disagree: I enjoy the challenge.'

Term 3: 'Agree: Lecturers and course books often contradict one another – it's hard to know which is right.'

Responses to the second statement, which was about the nature of medical science, also produced examples of what could be interpreted as 'C'→'B' movement:

Statement: *A good thing about medical sciences is the fact that everything is so clear-cut, either right or wrong.*

The following were the justifications offered by one traditional student:

Term 1: 'Disagree: I do not think everything is clear-cut – quite the opposite – there's a great deal of mystery and alternatives.'

Term 3: 'Disagree: There are many different opinions on subjects, even a difference between a lecturer's opinion and that of the course textbook.'

While another said:

Term 1: 'Disagree: Not all medical sciences are clear-cut, depends on situations and a variety of things – lots of shades of grey.'

Term 3: 'Disagree: Although there is right and wrong to a certain extent, it does not always seem so. There are different ways of putting things, which I sometimes find confusing.'

Such examples of a C→B movement may represent 'escape', one of the 'alternatives' to progression proposed by Perry (1981), in which the person is in a 'middle' position, avoiding the implications of making a choice associated with 'Relativism' - a 'C' position in Johnstone's (1999) adaptation of Perry's Positions. However, it is difficult and probably unwise to draw conclusions on the basis of responses to two less-than-ideal statements.

Based on the interview material and the 'free' comments given in the Term 3 questionnaire, possible reasons for the 'backwards' movement among the traditional students can be suggested. Among these are factors such as volume of work, especially the much more onerous workload in first year reported by traditional

students; the comparatively lower levels of motivation reported by them; related to motivation, a questioning of the relevance, to their future careers as doctors, of the basic science subjects they were studying; and the pressures from frequent exams throughout the year that the traditional students had faced.

In terms of change 'forwards', the area which showed this to the greatest extent, for both PBL and traditional students, was perceptions about what was expected of them in exams/assessments, discussed in more detail below (Section 12.3). Only slightly less marked, for the traditional students, was the proportion who reported a change 'forwards' in relation to how they viewed the student's role, almost all moving to a 'C' position in Term 3 from a 'B' position in Term 1 (the one exception moving from 'A' to 'C'). The following comment was volunteered by one of the traditional students. While it includes a reference to exams, it is concerned more broadly with the student's role.

'I have realised that what I'm studying or how I'm studying now should not only be geared towards doing well in examinations but to get a good wealth of knowledge so that I can be competent as a doctor in future.'

Responses to the 'B' series of Likert-type statements in the learning perceptions questionnaire highlighted one or two areas that were problematic for the PBL students in particular. These existed at the beginning of first year and there was some

evidence that they had increased by the end of it. For this reason, they can be interpreted as a change 'backwards' for the PBL students. In comparison with the traditional students, those in the PBL course reported less confidence and more confusion and uncertainty over course content and the 'appropriate' approach to take to given topics. For example, if they discovered conflicting opinions about a subject, they were anxious to know which was the 'right' one. The following comments, in both Term 1 and Term 3, were each given by different PBL students.

'It's hard to know what is right when different things are explained differently by different sources.' Comment made in Term 1.

'I wouldn't know which theory is most supported or which to write in an exam for an answer.' Comment made in Term 3.

'When you are trying to work independently, this can lead to confusion and an inability to see the wood for the trees.'
Comment made in Term 3.

'This feeling [of confusion] stems from uncertainties about depth [of study required] and the total and radical change in the way of learning (i.e., self-learning).' Comment made in Term 3.

Often in books one says one thing and another seems to imply something else ... there are so many different names for one thing, it can get very confusing.' Comment made in Term 1.

‘Sometimes contradictions in different books make things uncertain, and guidance from lecturers would be helpful.’

Comment made in Term 1.

‘Sometimes it can be scary to do all this work on your own in case what you learn is wrong.’

Comment made in Term 1.

‘It is difficult to work out what is right or most feasible, as an uneducated student, without guidance from staff. Difficult to evaluate when students’ knowledge is not enough to make an informed decision on the relevance of information, i.e., which is more relevant than the other.’

Comment made in Term 3.

These kinds of comments, made during first year in the learning perceptions questionnaire, were echoed by those made in the interviews with the PBL students towards the end of their second year in relation to their levels of confidence in passing at different stages of the medical course and what they had found most difficult in their studies. In comparison with the traditional students, the confidence levels of the PBL students were possibly lower overall and more variable. Also, what they had found difficult was knowing what was expected of them in the new curriculum and how much depth and breadth of knowledge were required of them in order to cover the ‘core’ content satisfactorily. The traditional students, in their

unstructured comments in the learning perceptions questionnaire at the end of first year, had also referred to uncertainty about what was expected of them, especially with regard to knowing what information was 'essential' for exam purposes rather than 'merely interesting'. However, for the traditional students, these comments were considerably less prominent than for the PBL students.

These aspects which were problematic for the PBL students are identical to those revealed in other medical studies mentioned in Chapter 2. For instance, greater concerns, on the part of PBL students, about breadth of knowledge required and being able to identify the 'essential' or 'core' information were referred to by Albanese and Mitchell (1993) in their meta-analysis of research studies in PBL in medicine. The fulfilment of pre-course expectations that there would be gaps in their 'necessary' knowledge and fears that incorrect information would be reinforced by co-students and 'naïve' staff were highlighted by Bernstein *et al* (1995). Uncertainty about how to tackle preparation for the course examination was reported by Birgegård and Lindquist (1998). Uncertainty about what was expected of students and a perceived lack of feedback on progress was reported by Kaufman *et al* (1998), and these were also reported as sources of stress in Moffat *et al*'s (1998) Glasgow study of the PBL cohort following the 1996-97 cohort who participated in the current study

Lancaster *et al* (1997) and Lieberman *et al* (1997) investigated the extent to which students' pre-course expectations about their learning environment in PBL and traditional courses were realised. Generally, those of the PBL students were

exceeded, in terms of factors such as the meaningfulness of the learning experience, the emotional climate that was established, the quality of student interaction and the flexibility of staff and the curriculum. The single area which did not come up to expectation for the PBL students was organisation of the course, which included aspects such as the cohesiveness of the course, clarity of learning objectives, and the extent to which objectives and examinations matched. In their view, the organisation they experienced during the course fell short of initial expectations.

In the current study, students were not asked to predict what their learning environment might be like in first year. Yet comments made in the interviews and in the 'comments' sheet (enclosed with the Term 3 learning perceptions questionnaire) were indicative of this concern about organisation but with a sharper focus on lectures. Some of the PBL students entered pleas for some lecture sessions to be incorporated in their course. This did not seem to be a desire for 'spoon-feeding' on the part of the students but rather for an organising framework, to complement and reinforce what they had discovered through their own independent learning. Two examples of such comments are:

'More back-up lectures to *supplement* rather than replace PBL would be very helpful'

'I strongly believe there needs to be an increase in "reinforcement lectures" to consolidate and aid in our understanding of core topics (e.g., coagulation, immunology, neurology, etc).'

12.4 Perceptions of exams/assessments by students in both curricula

A striking feature of the data gathered by means of the learning perceptions questionnaire was the extent to which responses to questions about exams/assessments produced quite different patterns, compared with the responses relating to the other three elements of the learning environment - student's role, role of staff, and nature of knowledge. Also, the different patterns associated with exams/assessments were found within each cohort of students, not just between cohorts.

Two points can be made about the analyses of students' perceptions of assessment situations. Firstly, compared with the other three elements of the learning environment mentioned above, the exam/assessment element was the one in which the lowest proportion of students in both groups reported a 'C' stance at the end of first year: 22% of the traditional students and 60% of the PBL students. Secondly, of all the four elements, perceptions about exams/assessments demonstrated the largest divergence, by the end of first year, between students in the traditional and PBL courses, as evidenced in the percentage figures just noted.

In relation to the first point, the students' retrospective 'pre-university' views about exams/assessments showed that many students had further to 'travel' to reach a 'C' position at the end of first year. At the retrospective stage, there was a polarisation of

views associated with an 'A' position among students in both courses, with approximately half the students endorsing this kind of stance on assessment. This was quite different from views about knowledge, which polarised at this stage at 'C', and about student and staff roles, both of which showed a spread of responses across 'A', 'B' and 'C' positions.

However, shortly into first year, by the middle of Term 1, there were significant differences between the two cohorts in relation to exams/assessments, with proportionately more of the PBL students now reporting a 'C' position and proportionately more of the traditional students still reporting an 'A' position. At the end of first year, the differences between the two groups, in relation to the assessment element, were highly significant, in the same direction as in Term 1 but with a more pronounced imbalance between the two groups in respect of the proportions at 'C and 'A' positions. There was evidence that, for the traditional group, there had been some movement 'backwards', amongst those already at 'C', between first and third terms. At the end of their respective first years, just over one-fifth of the traditional students, compared with three-fifths of the PBL students, regarded assessment situations as allowing them scope for presenting what they had drawn from sources other than lectures and for giving evidence of their own thinking.

The following excerpts from comments in the learning perceptions questionnaire illustrate the nature of 'A' and 'C' -type perceptions in relation to exams/assessments. Those reflecting 'A' perspectives were given by five different students in the traditional course, those reflecting 'C' perspectives by five students in the PBL course.

- 'A': 'I used to prefer the open long questions but after what I have experienced during the academic year, I know I prefer clear-cut answers/questions.'**
- 'A': 'There is no room for thought – all you do is learn crap and regurgitate it ... I don't feel that [this] response is what I would like but this appears to be what is expected of me. This sucks ... I don't necessarily agree with the lecturer but I answer exams with his opinion as he will be responsible for the marking scheme.'**
- 'A': 'Most of the things we learn are proven facts – there's no point learning about vague things.'**
- 'A': 'Objectives should be provided in all subjects for all sections of the course so students can clearly see what material is examinable and essential. This way there will be no problem with lecturers introducing extra material into lectures.'**
- 'A': 'I prefer short clear-cut answers compared to open long questions because it is more objective in the sense of marking.'**

- 'C':** 'Throughout the year, we have come across many 'grey' areas of many subjects, which makes it more interesting and thought-provoking.'
- 'C':** 'Scientific subjects are filled with uncertainty and this is why they are so interesting. They need to be looked at from many angles in order to fully understand their concepts.'
- 'C':** 'The beauty and enjoyment of science lies in the fact that there are many ways to look at things and many options to explore.'
- 'C':** 'I enjoy getting to grips with so many different angles and creating my own personal way of understanding.'
- 'C':** '...much of what we learn makes sense when we stand back and think about the reasoning behind it. It is easy to become overloaded with facts; it is not possible to learn *everything* but rather get an overview and grasp the basics.'

As mentioned above, there was evidence that the traditional students, as a group, moved 'backwards' over the year in relation to their views about assessment. There was further evidence of this trend when the responses of individual students were traced over the year. More than a quarter of the traditional students demonstrated a change 'backwards', mostly to an 'A' position. A smaller proportion of the PBL students, just over 10%, also showed some move 'backwards' in the assessment

element but their destinations at the end of first year were equally distributed between 'A' and 'B' positions.

Perhaps the quotations from students that are given above cast some light on possible reasons for the findings that a far smaller percentage of students in the traditional course thought of exams/assessments in 'C' terms, that proportionately more of them moved 'backwards' in this respect over the first year, and that this movement was towards an 'A' position. The very nature of the content of the quotations illustrating the 'A' perspectives given by the traditional students embody a much more restricted, syllabus-bound approach to learning, with exams very much regarded as the end towards which the students were working. This kind of perspective one might expect to be associated closely with perceptions of exams at school and college, and there was evidence of it among the retrospective 'pre-university' evaluations of many students in both courses. The (relatively) more familiar teaching/learning environment embodied in the traditional course was likely to reinforce that way of thinking about exams. Indeed, it is possible that, for many school-leavers, it would be difficult to envisage alternative forms of 'exams' or assessments, especially at university level. It can be argued, of course, that, for the traditional students, this was a realistic and sound approach to adopt, and one that had perhaps been validated by their first year experience. In both their interviews and comments in the learning perceptions questionnaire, it was clear that the students in the traditional course felt the pressure from numerous exams during the year, that the volume of work had been heavy, and that it was often difficult to identify what they 'needed' to know for the exams. However, at least, they had had plenty of 'first-hand' experience of university

exams before completing the questionnaire and many had drawn their own conclusions about what they thought was wanted in exam answers

In contrast, the PBL students were just facing their first 'professionals' soon *after* completing the learning perceptions questionnaire in Term 3. It was clear from the interviews that many of the PBL students felt that the course assessments they completed during the year gave inadequate preparation for end-of-year exams. In the end-of-year learning perceptions questionnaire, one PBL student stated:

'It's right that we take responsibility for our own learning and not be spoon-fed by staff BUT, when push comes to shove, we still have to pass exams so we need SOME idea of what we need to know for the exam.'

It is possible, therefore, that the questionnaire responses of the PBL students reflected their different experience of 'assessment'. On a slightly different but important tack, one student made an apt comment about Likert statement 12 in the questionnaire (*'I like assessments which give me an opportunity to show I have ideas of my own.'*):

'It's all very well giving assessments which allow students the opportunity to "show they have ideas of their own" but the marking of these assessments must reflect this in order for these to be worthwhile.'

The exam/assessment element also showed change 'forwards' for a large minority of students in both courses (23% of traditional students; 29% of PBL students). Of those who did change 'forwards', most of the PBL students and just over a half of the traditional students moved to 'C' from 'A' and 'B' positions. In view of the points considered above, it is perhaps surprising that there was evidence of any movement 'forwards', particularly for the traditional students.

It is quite apparent, from both the learning perceptions questionnaire and interviews, that exams/assessments were areas that students found especially difficult, in particular, their frequency in the traditional course and their infrequency in the PBL course. In the end, what the results suggest is the 'commonsense' conclusion: that forms of assessment, what students perceive is expected of them in exams/assignments, and what staff perceive as assessment demands are all associated with how students are likely to perceive other important features of their learning environment, such as their expectations of staff and of themselves as students and how they regard the subject matter of their studies.

12.5 Positive correlations between 'C' perspectives and personality factors, *openness to experience* and *agreeableness*.

For all students, regardless of whether they were in the traditional or PBL course, a highly significant positive correlation was found between their scores on the personality dimension, *openness to experience*, and 'C'-ness (in terms of 'distance

from A' score) as measured by the 15 Likert statements in the learning perceptions questionnaire completed near the end of first year. In other words, there is a close association between high scores on *openness*, one of the factors in Costa and McCrae's five-factor theory of personality (see Table 18, Chapter 7, for description of *openness to experience*), and a 'C' stance, *vis-à-vis* student and staff roles, the nature of knowledge, and the student's task in assessment situations, as was described in the adapted version of Perry's scheme of cognitive and ethical development (Table 1, Chapter 2). More specifically, a student who is intellectually curious, flexible in thinking, creative, imaginative, willing to question authority, and exercises independent judgement is also likely to be confident in his/her ability to learn, to think independently and debate; to enjoy exploring contexts, searching for inter-relationships, and being creative; and to value the views of both staff and co-students in the learning process.

As mentioned in Chapter 2, *'tolerance of ambiguity'*, which has been investigated in a few studies of medical students and practitioners, would also seem to relate to both 'C'-ness and openness to experience. However, no studies of *'tolerance of ambiguity'* in the context of comparing PBL and conventional curricula could be traced. The correlation found between openness and a 'C' perspective in this study does have indirect links with results from two other studies of personality factors in medical students. One study looked at the personality traits of volunteers for PBL and traditional courses (Cariaga-Lo *et al*, 1996) in which the researchers concluded that those who were independent, reflective and capable might be better prepared for

the less structured format of a PBL curriculum than those who were less self-sufficient and more comfortable with clearly defined roles.

The other personality dimension in the current study that was associated significantly with a 'C' perspective was *agreeableness*. For male and female students in the PBL course and for females (but not males) in the traditional course, there was a significant positive correlation between 'C' perspectives and altruism, sympathy for others and eagerness to help others. Costa and McCrae (1992), however, suggested that low, not high, scores of agreeableness were possibly associated positively with critical thinking :

'... the readiness to fight for one's interests is often advantageous ...

Skeptical and critical thinking contributes to accurate analysis in the sciences.'

(Costa and McCrae, 1992:15)

It was for this reason that it was hypothesised initially that scores of agreeableness would be negatively correlated with 'C' perceptions. The result obtained, therefore, was in the opposite direction to that which had been expected. Although the positive association makes sense in the context of small-group learning, a high degree of agreeableness does not seem to capture the expected link with a critical approach to thinking or the elements of confrontation and challenge that are likely to be part of any group learning experience.

Although they did not compare students in PBL and traditional courses, Fox and West (1984) found that students who chose less traditional forms of self-directed learning, i.e., forms less closely associated with the academic institution itself, shared personality traits. Compared with those who adopted a more traditional approach, the former were more comfortable with ambiguity, more aesthetic, they sought autonomy, and were less anxious. Fox and West raised an important point about whether those students who were likely to cope with independent study – and were likely to be effective lifelong learners - should be identified at the course admissions stage (and admitted to a given course) or should students be admitted anyway and *trained* during their studies to become ‘good’ lifelong learners. The former implies that effective lifelong learning is associated with relatively stable traits that are unlikely to change with time, while the latter assumes that lifelong learning is akin to a skill that can be developed after embarking upon a course.

A number of researchers and writers in the medical education literature (e.g., Block, 1996; Lancaster *et al*, 1997; Rosenthal and Ogden, 1998) have highlighted the link between problem-based learning and *adult* learning principles, stressing the point that such principles, with their special focus on self-directed learning, provide the foundations for PBL. ‘Self-directed learning’ is certainly one of the fundamental concepts in adult education, and evokes associations with a cluster of terms, for instance, ‘autonomy’, ‘independent learning’, and ‘learner-centredness’. In an observation which is reminiscent of points made in Chapter 2 about ‘problem-based learning’, Tennant (1997) stated:

'Like most foundation concepts, 'self-directed learning' is articulated in a way which allows seemingly limitless interpretations of what it is and how it should be applied.'

(1997: 7)

Despite the apparent plethora of understandings of the concept, there is some agreement on its general nature, which has clear relevance to problem-based learning in medical education. For example, Brookfield (1985), one of the major contributors to work on self-directed adult learning, emphasises the importance of learners appreciating the contextuality of knowledge (similar to the 'C' Position or Perry's Relativist and to Costa and McCrae's 'open' individuals) and being aware that values, beliefs and moral codes are formed and maintained in social and cultural settings. Self-direction is the person's capacity to critically reflect on this and to explore alternative perspectives.

Candy (1991) distinguished between autonomy as a learner, that is, the individual's capacity to pursue learning in a self-directed manner, and autonomy as a general personal attribute. The term, 'self-direction' in learning, he argues, refers to four phenomena: personal autonomy; the willingness and capacity to manage one's own learning; an environment allowing some effective control by the learner; and the independent pursuit of learning without formal institutional support or affiliation. He recognised that self-direction is understood as both a process (where learners

gradually take control of their learning) and an ideal end point where 'self-directedness' in some wider sense is developed.

In the research literature in adult education, there has been less of a focus on self-direction as a personal characteristic of the learner, including investigations of personality characteristics that might be associated with self-direction in learning. Indeed, some (e.g., Pratt, 1988) maintain that self-direction is a situational attribute of learners, not a general trait associated with being an 'adult' and, therefore, that adults will vary considerably in their desire, ability and willingness to exert control over their learning experience. Merriam and Caffarella (1991) state that:

'Autonomy ... is not necessarily context-free; there is a relationship comes into play for a person to be autonomous in certain learning situations.'

(1991: 217)

This debate can be seen to be paralleled in the psychological research into the extent to which personality changes or remains consistent during adulthood. The balance of the existing evidence, based largely on research carried out under the trait 'umbrella', is that most personality characteristics remain fairly stable in adulthood (Schaie and Willis, 1996). This area of research is fraught with methodological difficulties associated with gauging the relative impact on individuals of the ageing process itself,

generational differences associated with socio-cultural changes, and changes that might be specific to a given individual. A few studies have investigated self-reports of individuals made over fairly lengthy periods of time, for instance, 8 years (Siegler, George and Okun, 1979), 10 years (Costa and McCrae, 1977) and 18 years (Schaie, 1996). Costa and McCrae (1988), using the *NEO-PI*, found that there was considerable consistency, over a period of six years, in the dimensions of *Neuroticism*, *Extraversion* and *Openness to experience* in their model of personality. From studies such as these, it appears that individuals change very little in self-reported descriptions of personality traits over periods of up to 30 years and over the age range, 20 to 90 years (Cavanaugh, 1993).

However, as Cavanaugh (1993) and others (e.g., Digman, 1990) emphasise, the evidence for the absence of change in personality in adulthood comes from data which have been averaged across many individuals and that a more important issue is likely to be the role played by life experiences, 'the specifics of development and change', as Digman (1990: 436) notes. In other words, if a person experiences few events that induce him/her to change, then change is unlikely to occur and *vice versa*. One might reasonably expect that, in the case of many young adults, a lengthy period of higher education has the potential, at least, of being one such change factor, and that they will not emerge at the end completely untouched by it, perhaps especially in a course that is so focused on a specific profession after graduation.

In the context of the present study, the question arises of whether personality factors, such as openness to experience, should be taken into account as part of the admissions process, especially if it is acknowledged that individuals have the potential to continue to change and develop in young adulthood. The demand for places in the new PBL course at Glasgow has continued to increase and the Faculty of Medicine has responded by raising even further the tariff of academic qualifications. Perhaps, however, for such a radically re-designed course, other factors, including those which are less clearly cognitive in nature, need to be added, not to supplant academic qualifications but to supplement, and even enhance, them.

12.6 Conclusion

Before presenting the main conclusions to be drawn from the research study, it should be helpful to place these in the context of the methodology used in the research, by stating what can be claimed on the basis of the data gathered.

12.6.1 Claims that can be made on the basis of this study

1. The research design does not permit conclusions about cause and effect to be drawn, in other words, about whether the problem-based learning format in the new medical curriculum led directly to the differences in perceptions that were noted between students following the two different curricula. What has

been described in earlier Chapters is a considerable number of significant associations between, on the one hand, students matriculated in one or other of the two courses and, on the other, kinds of perceptions about the student learning experience in the first undergraduate year in medicine. Particular links were traced with factors reflecting the role of the undergraduate student, the role of members of staff, the task of the student in exam/assessment situations, and the nature of knowledge. The focus has been entirely on how students reported their experiences of this learning environment; the students' actual academic performance was neither included nor considered.

2. The response rates for the learning perceptions questionnaire were high for both cohorts at each of the points in time (Terms 1 and 3, Year 1) when it was administered. It was to be expected that the response rate for those students who returned the questionnaire on both occasions would decrease, especially since the students in the new PBL course were being asked to complete a considerable quantity of evaluation questionnaires in this first year. Bearing these two points in mind, the response rates for the return of the learning perceptions questionnaire on both occasions remain acceptable in survey research. With regard to the *NEO-FFI*, the response rates for those students who had already returned both of the learning perceptions questionnaire were higher, especially in the case of the PBL students. The rates for these questionnaires, therefore, were also acceptable.

In contrast, with reference to the interviews, the 'take-up' rate was rather low and also women were over-represented and men under-represented among those who attended for interview.

3. Even allowing for the chance occurrence of a very small proportion of the significant correlation coefficients; there was evidence, in different degrees, to support the reliability and validity of the learning perceptions questionnaire. Drawing on data from the Term 1 Year 1 questionnaire, the evidence was stronger for the internal consistency of the Likert-type statements, especially in relation to 'A' and 'C' statements and 'A' and 'B' statements. Evidence for concurrent validity was weaker, in terms of a relationship between two broad categories of response (*CCCC* and 'all other responses') to the sentence stems and the Likert-type statements. In the Term 3 Year 1 questionnaire, there was much stronger evidence for concurrent validity, deriving from the significant association between 'distance from A' scores (or 'C'-ness), based on the Likert-type statements, and the *openness to experience* scores in the *NEO-FFI*. The reliability and validity of the *NEO-FFI* are well-established.
4. Related to the first point, the data from the *NEO-FFI* and the responses to the structured items in the learning perceptions questionnaire do not *explain* the differences (or absence of differences) that were found between the two cohorts of students. Such data provide a means of *describing* the starting-

point and subsequent progression in initial undergraduate study for these two cohorts of students. Insights into some of the factors underpinning responses to the more quantitative data, including possible explanatory ones, emerged from the interview material and the more qualitative data from the learning perceptions questionnaire (i.e., the sheet for 'unstructured' comments in the Term 3 Year 1 questionnaire and the justifications offered in response to two statements in the Term 1 and Term 3 questionnaires).

5. Finally, as other researchers (e.g., Lancaster *et al*, 1997; Lieberman *et al*, 1997; Vernon and Blake, 1993) have indicated, it should be borne in mind that the differences observed between the two cohorts of students may not be long-term ones. By this is meant two things. First, the differences between the two cohorts admitted in 1995 and 1996 respectively may not endure beyond the first two undergraduate years. Second, the experience of subsequent cohorts in the PBL course may well be different from that reported here by the 1996-97 cohort, as the newness of the PBL course in medicine recedes and this format becomes more familiar to prospective students, especially at school level, as it develops and matures. In addition, university and clinical staff involved in the PBL course will become more accustomed to this approach to learning and their reactions to it, whether these be enthusiasm or misgiving, may be less discernible to the students.

12.6.2 Main conclusions from the research

The following research hypotheses were proposed in Chapter 1.

1. At the end of the first year, compared with the beginning, a higher proportion of students in both the traditional and PBL courses will report perceptions of their learning experience thought to be associated with a critical independent approach to learning.
2. In comparison with students in the traditional course, at the end of first year, a higher proportion of the students in the PBL course will report perceptions of their learning experience thought to be associated with a critical independent approach to learning.
3. In comparison with students in the traditional course, at the end of first year, a higher proportion of the students in the PBL course will have moved 'forwards' in their perceptions of their learning experience to those thought to be associated with a critical independent approach to learning.
4. For students in both courses, there will be a positive correlation between the personality dimension, *openness to experience*, and perceptions of the learning experience thought to be associated with a critical independent approach to learning.

5. For students in both courses, there will be a negative correlation between the personality dimension, *agreeableness*, and perceptions of the learning experience thought to be associated with a critical independent approach to learning.

A 'critical independent approach to learning' has been interpreted in the study as equivalent to a 'C'-type position within the adapted version of Perry's scheme of cognitive and ethical development.

A summary of the detailed results was presented in the previous Chapter. What follows is a set of general conclusions derived from these detailed results and which are related to the five research hypotheses above.

- A higher proportion of students in both courses reported 'C' perspectives on learning by the middle of the first term, compared with the proportions who appeared to hold these according to the retrospective 'pre-university' reports. However, patterns of change from first to third term were less consistent. Between first and third terms, the traditional group appeared to move backwards slightly, from a 'C' position, in their views of all but the student's role, where there was evidence of a slight shift forwards. It was still encouraging that more than half of the traditional cohort did report end-of-year 'C' perspectives in relation to staff and student roles and the nature of knowledge. The PBL group showed a slight movement backwards in perspectives on the student's role and the nature of knowledge but moved forwards vis-à-vis the student's task in

exam/assessment situations. The proportions of the PBL group who reported a 'C' position in relation to the role of staff remained similar in first and third terms.

The first hypothesis, then, was only weakly supported in each group of students. By inspection of the data, it was seen that, in the case of the traditional students, at the end of first year, a slightly higher proportion (than at the beginning of first year) reported 'C' perspectives in relation to views about the student role only. In the PBL group also, a higher proportion endorsing a 'C' stance at the end of first year was observed for one element only, in this case, the student's task in exams/assessments.

- From what appeared to be similar starting-points, in the form of their retrospective 'pre-university' perceptions, the views reported by students in the traditional and problem-based courses showed significant differences by the middle of the first term of first year, and these differences became even more marked by the end of first year. Generally differences between the two cohorts were in a consistent direction, favouring that which might be hoped for in a problem-based approach to learning, as described in the final column of Table 1 (Chapter 2). That is, there was evidence of attitudes that are likely to reflect a critical, self-directed student, a learner who is capable of evaluating information and evidence and who wants scope to demonstrate his/her understanding of the complexities of a field of study.

Hypothesis 2, therefore, is supported.

- In many of the analyses, for students in both courses, perceptions of examination and assessment situations were characterised by somewhat different patterns from those associated with other aspects of the students' learning experience, suggesting perhaps that change in and development of assessment (or, at least students' perceptions of and attitudes towards assessment demands) are not keeping pace with the PBL thrust in other aspects of the students' learning environment. It was one area in which there was evidence in both courses of some students moving 'back' while a large minority also moved 'forwards'. Students in both courses found 'exams' one of the most difficult aspects of their undergraduate experience but for different reasons – too many exams in the traditional course, too few (for exam practice and a source of feedback on progress) in the PBL course.
- Tracing the ways in which individual students in each course tended to change or not to change during first year showed that, for the most part, the end-of-year 'C' positions, for students in both courses who achieved 'C', represented, not a *change* to 'C', but instead a continuation of that position after the student had reached it in the middle of the first term. Generally, relatively small proportions of students in either course made such a progression during the academic year, and there was more evidence of shifts 'backwards' among the traditional students.

Hypothesis 3, therefore, was supported but the context in which it was supported should be noted, that is, that end-of-year 'C' positions tended to be those maintained since the first term and that, because of the high percentages of PBL students already reporting 'C' in the first term, there were relatively few of them remaining who could move forwards by the end of the year.

- **There was evidence that the PBL students, significantly more so than the traditional students, had uncertainties about and lacked confidence in knowing what was expected of them in their courses and what constituted 'essential' knowledge. Although they were more highly motivated and enjoying their course much more than the traditional students, the overall confidence level of the PBL students seemed lower and more variable, in terms of their confidence in passing at the various stages of the course. Levels of motivation among both groups appeared to be linked closely to visits to clinical settings and patient contact, anticipated in the traditional students and experienced by the PBL students.**

- **The two cohorts of students seemed not to differ in major ways in the specific approaches to studying they used, particularly in exam preparation. The volume of work anticipated by both cohorts had been high and was realised, in the case of the traditional students, but was actually being experienced by the pressure from frequent exams might have contributed to the 'backwards' shifts noted among the traditional students. The predominant features of a PBL format,**

such as independent thinking and integration of information, seem to have been successfully incorporated into the Glasgow course to the extent that its students could identify them and, on the whole, associate them closely with their course.

- For students in both courses, there was a highly significant positive correlation between their 'distance from A' scores at the end of first year and their scores on the personality variable, *openness to experience*. This suggested that 'C'-type perceptions were related to being open to experience, a trait that is thought to reflect intellectual curiosity, independence of judgement, and a willingness to question authority. Conversely, 'A'-type views were related to low scores on this personality dimension, in other words, to conventional behaviour, a conservative outlook, and a preference for the familiar rather than the novel.

The fourth hypothesis is supported.

- The description of *openness to experience* does seem to be similar to those features thought to be related to a 'C'-type perspective. In this way, this personality dimension provides an independent measure of students' self-reports in the learning perceptions questionnaire. The positive correlation between *openness to experience* and the overall measure of 'C' perceptions (as represented by greater distance from 'A') derived from the learning perceptions questionnaire appears to parallel the results from the various analyses of the different sections of the learning perceptions questionnaire. It also lends some support to the general descriptions of 'A', 'B' and 'C' positions contained in Table 1 (Chapter 2).

- One long-standing problem in the application of Perry's scheme in research into student learning has been the difficulty of assessing where students might be positioned within it, a difficulty that becomes even greater with large numbers of students. Given the positive correlation between 'C'ness and *openness*, one important outcome of the study is that this finding suggests the possibility of the latter providing an objective, reliable measure of positions within the adapted Perry scheme that was used in the study. It is also a measure that can be used with large numbers of learners and has a straightforward scoring procedure.
- No significant associations were found between end-of-year 'distance from A' scores and the personality dimensions of *neuroticism*, *extraversion* or *conscientiousness* for any of the students.
- Lastly, the fifth hypothesis, concerning the relationship between 'C'ness and *agreeableness*, was not supported and indeed the significant correlation between these two variables that was obtained was positive, not the negative one that had been predicted. In the case of female students in the traditional course and both male and female students in the PBL course, there was a significant positive correlation between 'distance from A' scores at the end of first year and the personality dimension of *agreeableness*, suggesting a link between 'C'-type perceptions of learning and altruism, sympathy for others and an eagerness to help others. For male students in the traditional course, no significant relationship was found between these two sets of scores.

The final distillation of all the results from this study suggests that the intentions of those who designed Glasgow's PBL course in medicine are being fulfilled, generally, in terms of encouraging changes in students' perceptions of important features of their undergraduate learning environment. There do appear to be one or two aspects that might benefit from further consideration. These relate mainly to student concerns over a course completely novel in approach, which is seen as stimulating and enjoyable but also rather unnerving because it lacks recognisable parameters.

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Appendix 1

The Learning Perceptions Questionnaire

Appendix 1.1: **The *Learning Perceptions Questionnaire* administered in Year 1, Term1 to students in the traditional course**

Appendix 1.2: **The *Learning Perceptions Questionnaire* administered in Year 1, Term1 to students in the PBL course**

Appendix 1.3: **The *Learning Perceptions Questionnaire* administered in Year 1, Term 3 to students in the traditional course**

Appendix 1.4: **The *Learning Perceptions Questionnaire* administered in Year 1, Term 3 to students in the PBL course**

Appendix 1.1

**The *Learning Perceptions Questionnaire* administered in Year 1, Term 1 to
students in the traditional course**

Appendix 1.2

**The *Learning Perceptions Questionnaire* administered in Year 1, Term 1 to
students in the PBL courses**

UNIVERSITY OF GLASGOW
TEACHING AND LEARNING SERVICE

Please read carefully the statements on the following pages and answer each question as accurately as possible.

SECTION A

1. Please enter your matriculation number in the box

2. Sex:
(please tick box) Male
 Female

3. Date of birth:

4. Please list your school leaving certificates (eg Highers, SYS, A levels etc), together with the year(s) in which you obtained them.

5. Did you enter university in the academic session immediately after you left school?
(please tick box)

No
Yes

If 'No', what did you do between leaving school and beginning your undergraduate course?

6. Have you obtained any other academic qualifications since leaving school?
(If 'Yes', please give details)

SECTION B

i) The statements below are about your views of knowledge and learning. There are four rows of statements. In each row, choose *ONE* statement which best fits *your present view* and circle the number in that box.

<i>My job as a student is:</i>	1. To accept the information given to me by the lecturer without question and to learn it.	2. To accept that some responsibility rests on me for learning, but I am not sure what is expected of me about what or how to learn.	3. To accept what is given, but to think about it critically, to check other sources for myself and to take responsibility for what and how I learn.
<i>I think the lecturer's job is:</i>	4. To give me all I need to know for the exams, but where there is more than one way of looking at things the lecturer should indicate clearly which way he prefers.	5. To provide me with information but I realise that the lecturer is not the only source of information and that I can find things out for myself to supplement what the lecturer has given.	6. To give me all I need to know for the exams and to avoid any extra non-examinable material.
<i>I think that knowledge is:</i>	7. A collection of unchangeable facts which are either right or wrong. I dislike uncertainties and vague statements. I am uncomfortable if I am asked to think for myself. I prefer to be given the facts.	8. Complex and by no means all black and white, but I find this exciting and stimulating. It makes me want to explore things for myself.	9. Not just a collection of black and white facts but that there are shades of grey. Things may be right or wrong depending upon circumstances and context. This uncertainty makes me feel uncomfortable.
<i>My job in my exam is:</i>	10. To give back the facts I have learned as accurately as possible. I prefer questions with single clear-cut answers rather than open long questions.	11. To answer the questions, including what I have been taught and what I have found out for myself from reading or other sources. I dislike questions which force me into a fixed answer (such as multiple choice) and prefer open questions in which I have room to show my own thinking.	12. To give back all I know about the topic and leave the examiner to give me credit for the relevant bits. I quite like open-ended questions, which allow me to show how much I know.

SECTION B *cont'd*

ii) *Before* you came to university, you may have held different views from those you hold now. Please go back to the grid on the previous page and select a box from each row which best represents your views then. Just enter the four box numbers here:

□	□	□	□
---	---	---	---

SECTION C

Please indicate the extent to which you *agree* or *disagree* with the statements below by circling the appropriate number.

5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree

- | | | | | | | |
|-----|--|---|---|---|---|---|
| 1. | I think it is the responsibility of the lecturer to give me all the information I need to pass the exam. | 5 | 4 | 3 | 2 | 1 |
| 2. | Sometimes there seem to be so many ways of looking at the course that I feel confused about what is right and wrong. | 5 | 4 | 3 | 2 | 1 |
| 3. | Sometimes I find I learn more about a subject by discussing it with other students than I do by sitting and revising at home. | 5 | 4 | 3 | 2 | 1 |
| 4. | There isn't any point in a course including things which will not be in the exam. | 5 | 4 | 3 | 2 | 1 |
| 5. | If I read something which doesn't agree with what I have been told in lectures, I prefer to stick with the lecturer's point of view. | 5 | 4 | 3 | 2 | 1 |
| 6. | If I had the choice of written comments or a specific mark at the end of a piece of coursework, I would choose the comments. | 5 | 4 | 3 | 2 | 1 |
| 7. | It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer. | 5 | 4 | 3 | 2 | 1 |
| 8. | I feel uncomfortable when I am left to make up my own mind about a subject, not knowing how the lecturer feels. | 5 | 4 | 3 | 2 | 1 |
| 9. | I enjoy undertaking tasks where the lecturer doesn't specify exactly what has to be done and it is left to me to decide. | 5 | 4 | 3 | 2 | 1 |
| 10. | A good thing about learning medical sciences is the fact that everything is so clear-cut; either right or wrong. | 5 | 4 | 3 | 2 | 1 |

- | | | |
|-----|--|-----------|
| 11. | The worst thing about a vague assignment is that you don't know exactly what the lecturer requires from you | 5 4 3 2 1 |
| 12. | I like exams which give me an opportunity to show I have ideas of my own | 5 4 3 2 1 |
| 13. | The only fair problem exercises are the ones which are exactly like those we have already done in class. | 5 4 3 2 1 |
| 14. | I sometimes choose a topic or a way of answering an exam question which I know the lecturer likes, in order to get higher marks. | 5 4 3 2 1 |
| 15. | It's good when a number of lecturers are teaching a course because you get not just one but a variety of opinions. | 5 4 3 2 1 |

SECTION D

Please circle the appropriate letter [A or D] if you **AGREE [A]** or **DISAGREE [D]** with the following statements. Justify each answer in a sentence or two.

A D A good thing about medical sciences is the fact that everything is so clear-cut, either right or wrong. *Justify your decision*

A D There sometimes seems to be so many ways of looking at scientific subjects, I feel confused about what is right and wrong. *Justify your decision*

A D When I meet a new idea in a course, I try to relate it to things I have met in other parts of the course. *Justify your decision* _____

THANK YOU FOR YOUR CO-OPERATION

Appendix 1.3

**The *Learning Perceptions Questionnaire* administered in Year 1, Term 3 to
students in the traditional course**

UNIVERSITY OF GLASGOW
TEACHING AND LEARNING SERVICE

Please enter your matriculation number

Please read carefully the statements on the following pages and answer each question as accurately as possible. Thank you for your co-operation.

SECTION A

The statements below are about your views of knowledge and learning. In each case, choose *ONE* statement which *best fits your view at present* and tick the appropriate box.

1. **My job as a student is:**
(tick one box only)

To accept the information given to me by the lecturer without question and to learn it.

To accept that some responsibility rests on me for learning, but I am not sure what is expected of me about what or how to learn.

To accept what is given, but to think about it critically, to check other sources for myself and to take responsibility for what and how I learn.

2. **I think the lecturer's job is:**
(tick one box only)

To give me all I need to know for the exams, but where there is more than one way of looking at things the lecturer should indicate clearly which way s/he prefers.

To provide me with information but I realise that the lecturer is not the only source of information and that I can find things out for myself to supplement what the lecturer has given.

To give me all I need to know for the exams and to avoid any extra non-examinable material.

SECTION A cont'd

3. **I think that knowledge is:**
(tick one box only)

A collection of unchangeable facts which are either right or wrong. I dislike uncertainties and vague statements. I am uncomfortable if I am asked to think for myself. I prefer to be given the facts.

Complex and by no means all black and white, but I find this exciting and stimulating. It makes me want to explore things for myself.

Not just a collection of black and white facts but that there are shades of grey. Things may be right or wrong depending on circumstances and context. This uncertainty makes me feel uncomfortable.

4. **My job in my exam is:**
(tick one box only)

To give back the facts I have learned as accurately as possible I prefer questions with single clear-cut answers rather than open long questions.

To answer the questions, including what I have been taught and what I have found out for myself from reading or other sources. I dislike questions which force me into a fixed answer (such as multiple choice) and prefer open questions in which I have room to show my own thinking.

To give back all I know about the topic and leave the examiner to give me credit for the relevant bits. I quite like open-ended questions, which allow me to show how much I know.

Please use this sheet if you would like

- i) to expand on any of your answers in the questionnaire

 - ii) to add any comments about your learning experience, in general, as a first year medical student
(eg has first year been easier/ more difficult/ much as you expected it to be; with hindsight, in what ways, if any, would you approach first year differently; do you think you have changed your methods of learning or studying in any way this year, etc)
-

SECTION B

Please indicate the extent to which you *agree* or *disagree* with the statements below by circling the appropriate number, eg ③.

5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree

- | | | | | | | |
|-----|--|---|---|---|---|---|
| 1. | I think it is the responsibility of the lecturer to give me all the information I need to pass the exam. | 5 | 4 | 3 | 2 | 1 |
| 2. | Sometimes there seem to be so many ways of looking at the course that I feel confused about what is right and wrong. | 5 | 4 | 3 | 2 | 1 |
| 3. | Sometimes I find I learn more about a subject by discussing it with other students than I do by sitting and revising at home. | 5 | 4 | 3 | 2 | 1 |
| 4. | There isn't any point in a course including things which will not be in the exam. | 5 | 4 | 3 | 2 | 1 |
| 5. | If I read something which doesn't agree with what I have been told in lectures, I prefer to stick with the lecturer's point of view. | 5 | 4 | 3 | 2 | 1 |
| 6. | If I had the choice of written comments or a specific mark at the end of a piece of coursework, I would choose the comments. | 5 | 4 | 3 | 2 | 1 |
| 7. | It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer. | 5 | 4 | 3 | 2 | 1 |
| 8. | I feel uncomfortable when I am left to make up my own mind about a subject, not knowing how the lecturer feels. | 5 | 4 | 3 | 2 | 1 |
| 9. | I enjoy undertaking tasks where the lecturer doesn't specify exactly what has to be done and it is left to me to decide. | 5 | 4 | 3 | 2 | 1 |
| 10. | A good thing about learning medical sciences is the fact that everything is so clear-cut; either right or wrong. | 5 | 4 | 3 | 2 | 1 |
| 11. | The worst thing about a vague assignment is that you don't know exactly what the lecturer requires from you. | 5 | 4 | 3 | 2 | 1 |
| 12. | I like exams which give me an opportunity to show I have ideas of my own. | 5 | 4 | 3 | 2 | 1 |

SECTION B cont'd

13. The only fair problem exercises are the ones which are exactly like those we have already done in class. 5 4 3 2 1
14. I sometimes choose a topic or a way of answering an exam question which I know the lecturer likes, in order to get higher marks. 5 4 3 2 1
15. It's good when a number of lecturers are teaching a course because you get not just one but a variety of opinions. 5 4 3 2 1

SECTION C

Please tick the appropriate box if you *AGREE* or *DISAGREE* with the following statements. Please justify each answer in a sentence or two.

	<i>Agree</i>	<i>Disagree</i>
A good thing about medical sciences is the fact that everything is so clear-cut, either right or wrong. <i>Please justify your decision briefly.</i>	<input type="checkbox"/>	<input type="checkbox"/>

There sometimes seems to be so many ways of looking at scientific subjects, I feel confused about what is right and wrong. <i>Please justify your decision briefly.</i>	<input type="checkbox"/>	<input type="checkbox"/>

When I meet a new idea in a course, I try to relate it to things I have met in other parts of the course. <i>Please justify your decision briefly.</i>	<input type="checkbox"/>	<input type="checkbox"/>

TEACHING AND LEARNING SERVICE

Please enter your matriculation number

□□□□□□□□

SECTION A

1. Sex:
(Please tick box)

Male

Female

2. Date of birth:

3. Please list your school leaving certificates (eg Highers, CSYS, A levels etc), together with the year(s) in which you obtained them.

4. Did you enter university in the academic session immediately after you left school?

(Please tick box) No

Yes

If 'No', what did you do between leaving school and beginning your undergraduate course?

5. Have you obtained any other academic qualifications since leaving school?
(If 'Yes', please give details)

SECTION B

1. The statements below are about your views of knowledge and learning. There are four rows of statements. In each row, choose **ONE** statement which *best* fits *your present view* and circle the number of the statement in that box, eg ①.

<p><u>My job as a student is:</u></p>	<p>1. To accept the information given to me by the lecturer without question and to learn it.</p>	<p>2. To accept that some responsibility rests on me for learning, but I am not sure what is expected of me about what or how to learn.</p>	<p>3. To accept what is given, but to think about it critically, to check other sources for myself and to take responsibility for what and how I learn.</p>
<p><u>I think the lecturer's job is:</u></p>	<p>4. To give me all I need to know for the exams, but where there is more than one way of looking at things the lecturer should indicate clearly which way he prefers.</p>	<p>5. To provide me with information but I realise that the lecturer is not the only source of information and that I can find things out for myself to supplement what the lecturer has given.</p>	<p>6. To give me all I need to know for the exams and to avoid any extra non-examinable material.</p>
<p><u>I think that knowledge is:</u></p>	<p>7. A collection of unchangeable facts which are either right or wrong. I dislike uncertainties and vague statements. I am uncomfortable if I am asked to think for myself. I prefer to be given the facts.</p>	<p>8. Complex and by no means all black and white, but I find this exciting and stimulating. It makes me want to explore things for myself.</p>	<p>9. Not just a collection of black and white facts but that there are shades of grey. Things may be right or wrong depending upon circumstances and context. This uncertainty makes me feel uncomfortable.</p>
<p><u>My job in my exam is:</u></p>	<p>10. To give back the facts I have learned as accurately as possible. I prefer questions with single clear-cut answers rather than open long questions.</p>	<p>11. To answer the questions, including what I have been taught and what I have found out for myself from reading or other sources. I dislike questions which force me into a fixed answer (such as multiple choice) and prefer open questions in which I have room to show my own thinking.</p>	<p>12. To give back all I know about the topic and leave the examiner to give me credit for the relevant bits. I quite like open-ended questions, which allow me to show how much I know.</p>

SECTION B *cont'd*

2. *Before* you came to university, you may have held different views from those you hold now. Please go back to the grid on the opposite page and select a statement from each row which *best* represented your views *then*. Just enter the numbers of the four statements here:

SECTION C

Please indicate the extent to which you *agree* or *disagree* with the statements below by circling the appropriate number, eg ③.

5 = *Strongly Agree*, 4 = *Agree*, 3 = *Neutral*, 2 = *Disagree*, 1 = *Strongly Disagree*

- | | | | | | | |
|----|--|---|---|---|---|---|
| 1. | I think it is the responsibility of the lecturer to give me all the information I need to pass the exam. | 5 | 4 | 3 | 2 | 1 |
| 2. | Sometimes there seem to be so many ways of looking at the course that I feel confused about what is right and wrong. | 5 | 4 | 3 | 2 | 1 |
| 3. | Sometimes I find I learn more about a subject by discussing it with other students than I do by sitting and revising at home. | 5 | 4 | 3 | 2 | 1 |
| 4. | There isn't any point in a course including things which will not be in the exam. | 5 | 4 | 3 | 2 | 1 |
| 5. | If I read something which doesn't agree with what I have been told in lectures, I prefer to stick with the lecturer's point of view. | 5 | 4 | 3 | 2 | 1 |
| 6. | If I had the choice of written comments or a specific mark at the end of a piece of coursework, I would choose the comments. | 5 | 4 | 3 | 2 | 1 |
| 7. | It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer. | 5 | 4 | 3 | 2 | 1 |
| 8. | I feel uncomfortable when I am left to make up my own mind about a subject, not knowing how the lecturer feels. | 5 | 4 | 3 | 2 | 1 |
| 9. | I enjoy undertaking tasks where the lecturer doesn't specify exactly what has to be done and it is left to me to decide. | 5 | 4 | 3 | 2 | 1 |

SECTION C *cont'd*

- | | | | | | | |
|-----|--|---|---|---|---|---|
| 10. | A good thing about learning medical sciences is the fact that everything is so clear-cut; either right or wrong. | 5 | 4 | 3 | 2 | 1 |
| 11. | The worst thing about a vague assignment is that you don't know exactly what the lecturer requires from you. | 5 | 4 | 3 | 2 | 1 |
| 12. | I like exams which give me an opportunity to show I have ideas of my own | 5 | 4 | 3 | 2 | 1 |
| 13. | The only fair problem exercises are the ones which are exactly like those we have already done in class. | 5 | 4 | 3 | 2 | 1 |
| 14. | I sometimes choose a topic or a way of answering an exam question which I know the lecturer likes, in order to get higher marks. | 5 | 4 | 3 | 2 | 1 |
| 15. | It's good when a number of lecturers are teaching a course because you get not just one but a variety of opinions. | 5 | 4 | 3 | 2 | 1 |

SECTION D

Please tick the appropriate box if you *AGREE* or *DISAGREE* with the following statements. Please justify each answer briefly in a sentence or two.

A good thing about medical sciences is the fact that everything is so clear-cut, either right or wrong. <i>Please justify your decision briefly.</i>	<i>Agree</i>	<i>Disagree</i>
	<input type="checkbox"/>	<input type="checkbox"/>

There sometimes seem to be so many ways of looking at scientific subjects, I feel confused about what is right and wrong. <i>Please justify your decision briefly.</i>	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

THANK YOU FOR YOUR CO-OPERATION

Appendix 1.4

**The *Learning Perceptions Questionnaire* administered in Year 1, Term 3 to
students in the PBL course**

TEACHING AND LEARNING SERVICE

Please enter your matriculation number:

Please read carefully the statements on the following pages and answer each question as accurately as possible (but without agonising over your answers!). Thank you for your time and co-operation.

SECTION A

The statements below are about your views of knowledge and learning. In each case, choose *ONE* statement which best fits your view at present and tick the appropriate box.

1. **My job as a student is:**
(tick one box only)

To accept the information given to me without question and to learn it.

To accept that some responsibility rests on me for learning, but I am not sure what is expected of me about what or how to learn.

To accept what is given, but to think about it critically, to check other sources for myself and take responsibility for what and how I learn.

2. **I think that the job of members of staff is:**
(tick one box only)

To give me all I need to know but where there is more than one way of looking at things, it should be indicated clearly which way is preferred.

To provide me with information but I realise that members of staff are not the only source of information and that I can find things out for myself to supplement what they have given.

To give me all I need to know and to avoid any extra non-examinable material.

3. **I think that knowledge is:**
(tick one box only)

A collection of unchangeable facts which are either right or wrong. I dislike uncertainties and vague statements. I am uncomfortable if I am asked to think for myself. I prefer to be given the facts.

Complex and by no means all black and white, but I find this exciting and stimulating. It makes me want to explore things for myself.

Not just a collection of black and white facts but that there are shades of grey. Things may be right or wrong depending on circumstances and context. This uncertainty makes me feel uncomfortable.

4. **My job in assessments and exams is:**
(tick one box only)

To give back the facts I have learned as accurately as possible I prefer questions with single clear-cut answers rather than open long questions.

To answer the questions, including what I have been taught and what I have found out for myself from reading or other sources. I dislike questions which force me into a fixed answer (such as multiple choice) and prefer open questions in which I have room to show my own thinking.

To give back all I know about the topic and leave the marker to give me credit for the relevant bits. I quite like open-ended questions, which allow me to show how much I know.

SECTION B

Please indicate the extent to which you agree or disagree with the statements below by circling the appropriate number, eg ③.

Please use this sheet if you would like

i) to expand on any of your answers in the questionnaire *Strongly Disagree*

ii) to add any comments about your learning experience, in general, as a first year medical student

1. (eg has first year been easier/more difficult/much as you expected it to be; with hindsight, in what ways if any would you approach first year differently; do you think you have changed your methods of learning or studying in any way this year, etc)

3. Sometimes I find I learn more about a subject by discussing it with other students than I do by sitting and revising at home.

4. There isn't any point in a course including things which will not be assessed.

5. If I find conflicting views on a topic, I like to know which is the right one.

6. If I had the choice of written comments or a specific mark at the end of a piece of coursework, I would choose the comments.

7. It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer.

8. I feel uncomfortable when I am left to make up my own mind about a subject, not knowing the opinions of staff.

9. I enjoy undertaking tasks where the member of staff doesn't specify exactly what has to be done and it is left to me to decide.

10. A good thing about learning medical sciences is the fact that everything is so clear-cut, either right or wrong.

11. The worst thing about a vague assignment is that you don't know exactly what staff require from you.

12. I like assessments which give me an opportunity to show I have ideas of my own.

SECTION B

Please indicate the extent to which you *agree* or *disagree* with the statements below by circling the appropriate number, eg ③.

5 = *Strongly Agree*, 4 = *Agree*, 3 = *Neutral*, 2 = *Disagree*, 1 = *Strongly Disagree*

- | | | | | | | |
|-----|---|---|---|---|---|---|
| 1. | I think it is the responsibility of the staff to give me all the information I need to pass. | 5 | 4 | 3 | 2 | 1 |
| 2. | Sometimes there seem to be so many ways of looking at the course that I feel confused about what is right and wrong. | 5 | 4 | 3 | 2 | 1 |
| 3. | Sometimes I find I learn more about a subject by discussing it with other students than I do by sitting and revising at home. | 5 | 4 | 3 | 2 | 1 |
| 4. | There isn't any point in a course including things which will not be assessed. | 5 | 4 | 3 | 2 | 1 |
| 5. | If I find conflicting views on a topic, I like to know which is the right one. | 5 | 4 | 3 | 2 | 1 |
| 6. | If I had the choice of written comments or a specific mark at the end of a piece of coursework, I would choose the comments. | 5 | 4 | 3 | 2 | 1 |
| 7. | It is a waste of time to work on problems which have no possibility of producing a clear-cut, unambiguous answer. | 5 | 4 | 3 | 2 | 1 |
| 8. | I feel uncomfortable when I am left to make up my own mind about a subject, not knowing the opinions of staff. | 5 | 4 | 3 | 2 | 1 |
| 9. | I enjoy undertaking tasks where the member of staff doesn't specify exactly what has to be done and it is left to me to decide. | 5 | 4 | 3 | 2 | 1 |
| 10. | A good thing about learning medical sciences is the fact that everything is so clear-cut; either right or wrong. | 5 | 4 | 3 | 2 | 1 |
| 11. | The worst thing about a vague assignment is that you don't know exactly what staff require from you. | 5 | 4 | 3 | 2 | 1 |
| 12. | I like assessments which give me an opportunity to show I have ideas of my own. | 5 | 4 | 3 | 2 | 1 |

SECTION B cont'd

13. The only fair problems in a test are those which are exactly like those we have already encountered. 5 4 3 2 1
14. I sometimes choose a topic or a way of answering a question which I believe staff favour, in order to get higher marks. 5 4 3 2 1
15. It's good when a number of staff are teaching a course because you get not just one but a variety of opinions. 5 4 3 2 1

SECTION C

Please tick the appropriate box if you **AGREE** or **DISAGREE** with the following statements. Please justify each answer in a sentence or two.

	<i>Agree</i>	<i>Disagree</i>
A good thing about medical sciences is the fact that everything is so clear-cut, either right or wrong. <i>Please justify your decision briefly.</i>	<input type="checkbox"/>	<input type="checkbox"/>

There sometimes seems to be so many ways of looking at scientific subjects, I feel confused about what is right and wrong. <i>Please justify your decision briefly.</i>	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

Appendix 2

Individual Interviews

- Appendix 2.1** Letter inviting selected students in the traditional and PBL courses to take part in individual interviews
- Appendix 2.2:** Semi-structured interview schedule for students in the traditional and PBL courses PBL course
- Appendix 2.3:** Checklist of approaches to studying, administered during individual interviews with students in the traditional and PBL courses
- Appendix 2.4:** Checklist of features characterising the medical course, administered during individual interviews with students in the traditional and PBL courses

Appendix 2.1

Letter inviting selected students in the traditional and PBL courses to take part in individual interviews

Tuesday, May 13th 1997

Dear

Research Study: Undergraduates' perceptions of their learning experience during their medical training

You may remember filling in two questionnaires last year which asked you about your views of student learning as part of a longitudinal study of the students in your year group in medicine.

We would now like to interview a small sample of those who completed the questionnaires, to ask you about your experience as a medical undergraduate in the first two years of your medical course and your approaches to studying, especially for exam preparation. The interview would give you the opportunity to say more about your views of student learning than was possible within the restrictions of a questionnaire.

Would you be willing to take part in a short informal interview, lasting no more than half-an-hour? I'm enclosing a reply slip and a stamped, addressed envelope. The interview will take place in the Department of Adult and Continuing Education, 57-61 Oakfield Avenue. We appreciate you have a busy timetable of classes and also exams in the near future, so the suggested dates/times may not suit you. If you would prefer to arrange an alternative date or time, please either write in an alternative date/time on the reply slip or phone me (Direct Line: 330 4397) or Mrs Moira McLaren (Direct Line: 330 6106). If you would like to meet at or around lunchtime, I'm sure we could provide some sandwiches! Would one of the following dates be suitable for you?

Monday 19th May at approx. 1.15-1.30 pm ***OR***
(after the Drama session has finished)

Wednesday 28th May at 1.15 pm

Many thanks for your help.

Yours sincerely

Alison Mackenzie
Lecturer in Psychology

Undergraduates' perceptions of their learning experience during their medical training

Your name:

Please tick the appropriate box:

- I can come for interview on *Monday 19th May*
(after the Drama session)
 - I can come for interview on *Wednesday 28th May at 1.15 pm*
 - I do not wish to take part in an interview
-

Appendix 2.2

Semi-structured interview schedule for students in the traditional and PBL courses PBL course

YEAR 2

1(a) Many students report that the workload is one of the major features of undergraduate study. How have you found the volume of work in the first two years of your medical course?

(b) Prior to coming to university, did you anticipate this amount of work?

(c) Does your course leave you sufficient time for:

i) friends, family?

ii) leisure (sports, interests)?

2. **Can you remember the approaches to studying you used at school, especially when you were preparing for exams?
(off by heart/understanding/cramming/working consistently)**

3. **Have you continued to use these approaches in the first two years in medicine?**

Yes

No

If 'YES', have they seemed to 'work' for you?

If 'NO', how have they changed?

Do these 'work'?

(b) At the beginning of second year, of passing second year?

(c) How confident would you say you are about completing the medical course?

8. What have you found to be the most difficult aspect of undergraduate study (if anything)?

9. List of features of course. Any further comment about any of these aspects?

10. Any points you would like to make about your experience of studying as a medical undergraduate?

Appendix 2.3

Checklist of approaches to studying, administered during individual interviews with students in the traditional and PBL courses

16. For each topic I study, I organize the important headings or key words into files _____ 1 2 3 4 5

How frequently do you use the following approaches to prepare for exams?
 what I already know or to my past experiences _____ 1 2 3 4 5

17. I organize each topic around central ideas or _____ 1 2 3 4 5
 Rate each statement on a scale of 1 to 5 where:

- 1 = *Never*
- 2 = *Occasionally*
- 3 = *Fairly often*
- 4 = *Most of the time*
- 5 = *Always*

19. I try to work out which questions will come up in the exams and prepare for these _____ 1 2 3 4 5

20. I discuss most of the material with other students _____ 1 2 3 4 5

21. When I get 'stuck', I discuss the problem with another student _____ 1 2 3 4 5

1. I have no specific plan for revision but study as topics occur to me _____ 1 2 3 4 5
2. I write down a schedule for revision _____ 1 2 3 4 5
3. I stick to a revision schedule _____ 1 2 3 4 5
4. I 'cram' for exams by starting revision about a week or a few days before the exam _____ 1 2 3 4 5
5. I set specific targets during my revision _____ 1 2 3 4 5
6. I begin to revise seriously for exams some weeks before _____ 1 2 3 4 5
7. I read over my own course/lecture notes _____ 1 2 3 4 5
8. I read recommended textbooks _____ 1 2 3 4 5
9. I read around the subjects _____ 1 2 3 4 5
10. I try to learn most of the material 'off by heart' _____ 1 2 3 4 5
11. As I read textbooks, I write down the important points. _____ 1 2 3 4 5
12. I underline/highlight key words/phrases/sentences in my notes. _____ 1 2 3 4 5
13. I select specific areas for revision rather than trying to cover everything in the course. _____ 1 2 3 4 5
14. I make summaries of my notes on each topic. _____ 1 2 3 4 5
15. I use mnemonics (rhymes, sayings, e.g. 'S2, 3, 4 keeps your rectum off the floor!') to help me remember information _____ 1 2 3 4 5

Appendix 2.4

- | | | | | | | |
|-----|--|---|---|---|---|---|
| 16. | For each topic I study, I organise the important headings or key words into lists_____ | 1 | 2 | 3 | 4 | 5 |
| 17. | I try to understand new material by trying to link it to what I already know or to my past experience_____ | 1 | 2 | 3 | 4 | 5 |
| 18. | I organise each topic around central ideas or themes_____ | 1 | 2 | 3 | 4 | 5 |
| 19. | I try to work out which questions will come up in the exams and prepare for these_____ | 1 | 2 | 3 | 4 | 5 |
| 20. | I discuss most of the material with other students_____ | 1 | 2 | 3 | 4 | 5 |
| 21. | When I get 'stuck', I discuss the problem with another student_____ | 1 | 2 | 3 | 4 | 5 |
| 22. | When I get 'stuck', I raise the problem with a member of staff_____ | 1 | 2 | 3 | 4 | 5 |

Appendix 2.4

Checklist of features characterising the medical course, administered during individual interviews with students in the traditional and PBL courses

To what extent have the following features characterised your medical course in general?

Circle the appropriate number on a scale of 1 to 5 where:

1 = *to a small extent*

5 = *to a large extent*

<i>Learning of details</i> _____	1	2	3	4	5
<i>Understanding of principles and being able to use them</i> _____	1	2	3	4	5
<i>Integrating different subjects or topics in order to solve problems</i> _____	1	2	3	4	5
<i>Making decisions on your own</i> _____	1	2	3	4	5
<i>Thinking independently</i> _____	1	2	3	4	5
<i>Solving problems</i> _____	1	2	3	4	5
<i>Gathering and analysing information</i> _____	1	2	3	4	5
<i>Stimulating and enjoyable</i> _____	1	2	3	4	5
<i>Has stimulated you to learn more</i> _____	1	2	3	4	5
<i>Has stimulated you to read medical literature</i>	1	2	3	4	5

Appendix 3

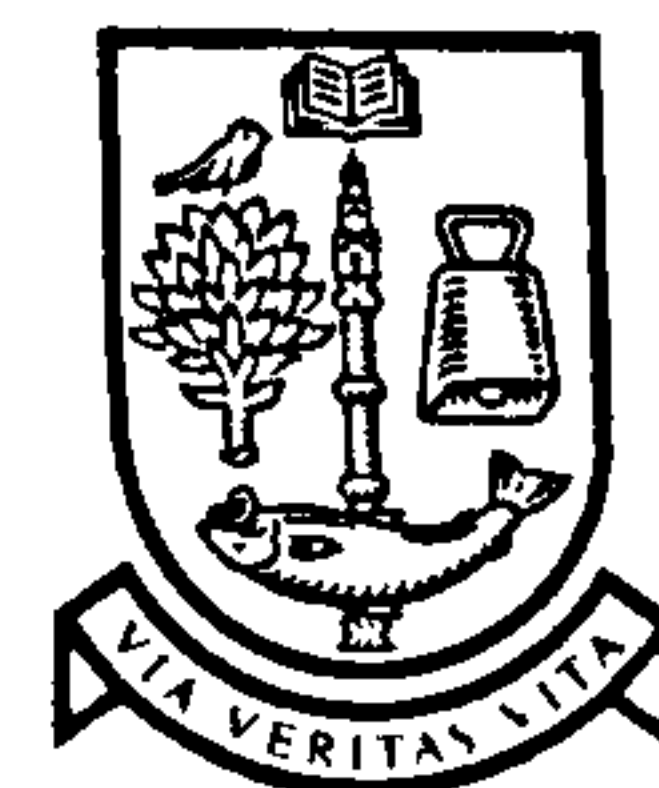
The *NEO* Five Factor Inventory (*NEO-FFI*)

Appendix 3.1: Letter distributed with the *NEO* Five-Factor Inventory

Appendix 3.2: The *NEO* Five Factor Inventory

Appendix 3.1

Letter distributed with the *NEO* Five-Factor Inventory



UNIVERSITY
of
GLASGOW

Wednesday, 18th March 1998

Dear Student

Research Study: Undergraduates' perceptions of their learning experience in traditional and problem-based curricula

With Professor Alex Johnstone of the University's Centre for Science Education, I am carrying out a long-term study of your year group in medicine. The aim is to investigate your perceptions at various stages of your undergraduate course. We are also interested in comparing your views with those of the last group of students in the former course. The research has involved both questionnaires and interviews with individual students.

This questionnaire is the final one in the current phase of the research. You may remember completing a questionnaire at the beginning and end of your first year which asked you about your views about your role as a student, the role of staff, what was expected of you in assessments, etc. This time we are interested to see whether there is any relationship between these perceptions of learning and personality traits.

The information obtained from you as an individual is **STRICTLY CONFIDENTIAL** to me - no information about students' individual responses in questionnaires and interviews is entered in any form in any central, Faculty or Departmental records nor is information conveyed in a way that would allow individual students to be identified. Your matriculation number is required to enable me to match up your various questionnaires and interviews at the different stages of the course. Your matriculation number is *not* entered into the research data base, also to ensure confidentiality.

Please note also that you have the right NOT to take part in the research if you do not wish to do so.

Many thanks for your help.

Yours sincerely

Alison Mackenzie
Lecturer in Psychology

DEPARTMENT OF ADULT AND CONTINUING EDUCATION

59 Oakfield Avenue, Glasgow G12 8LW

Telephone: 0141-330 4394 (24 Hour) / 0141-339 8855 Ext ~~4397~~ Direct Line: 0141-330 4397/6106

Fax: 0141-330 3525

Appendix 3:2

The *NEO* Five Factor Inventory

NEO

Five-Factor Inventory

Form S

Paul T. Costa, Jr., Ph.D., and Robert R. McCrae, Ph.D.

Instructions

Write only where indicated in this booklet. Carefully read all of the instructions before beginning. This questionnaire contains 60 statements. Read each statement carefully. For each statement fill in the circle with the response that best represents your opinion. Make sure that your answer is in the correct box.

Fill in (SD) if you *strongly disagree* or the statement is definitely false.

Fill in (D) if you *disagree* or the statement is mostly false.

Fill in (N) if you are *neutral* on the statement, you cannot decide, or the statement is about equally true and false.

Fill in (A) if you *agree* or the statement is mostly true.

Fill in (SA) if you *strongly agree* or the statement is definitely true.

For example, if you *strongly disagree* or believe that a statement is definitely false, you would fill in the (SD) for that statement.

Example

(D) (N) (A) (SA)

Fill in only one response for each statement. Respond to all of the statements, making sure that you fill in the correct response. DO NOT ERASE! If you need to change an answer, make an "X" through the incorrect response and then fill in the correct response.

Note that the responses are numbered in *rows*. Before responding to the statements, turn to the inside of the booklet and enter your name, age, and sex and the date.

PAR Psychological Assessment Resources, Inc./P.O. Box 998/Odessa, FL 33556/Toll-Free 1-800-331-TEST

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9 8 7 6 5 4 3 2

Reorder #RO-1452

Printed in the U.S.A.

Name _____ Age _____ Sex _____ Date _____

1. I am not a worrier.
2. I like to have a lot of people around me.
3. I don't like to waste my time daydreaming.
4. I try to be courteous to everyone I meet.
5. I keep my belongings clean and neat.

6. I often feel inferior to others.
7. I laugh easily.
8. Once I find the right way to do something, I stick to it.
9. I often get into arguments with my family and co-workers.
10. I'm pretty good about pacing myself so as to get things done on time.

11. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.
12. I don't consider myself especially "light-hearted."
13. I am intrigued by the patterns I find in art and nature.
14. Some people think I'm selfish and egotistical.
15. I am not a very methodical person.

16. I rarely feel lonely or blue.
17. I really enjoy talking to people.
18. I believe letting students hear controversial speakers can only confuse and mislead them.
19. I would rather cooperate with others than compete with them.
20. I try to perform all the tasks assigned to me conscientiously.

21. I often feel tense and jittery.
22. I like to be where the action is.
23. Poetry has little or no effect on me.
24. I tend to be cynical and skeptical of others' intentions.
25. I have a clear set of goals and work toward them in an orderly fashion.

26. Sometimes I feel completely worthless.
27. I usually prefer to do things alone.
28. I often try new and foreign foods.
29. I believe that most people will take advantage of you if you let them.
30. I waste a lot of time before settling down to work.

31. I rarely feel fearful or anxious.
32. I often feel as if I'm bursting with energy.
33. I seldom notice the moods or feelings that different environments produce.
34. Most people I know like me.
35. I work hard to accomplish my goals.

36. I often get angry at the way people treat me.
37. I am a cheerful, high-spirited person.
38. I believe we should look to our religious authorities for decisions on moral issues.
39. Some people think of me as cold and calculating.
40. When I make a commitment, I can always be counted on to follow through.

41. Too often, when things go wrong, I get discouraged and feel like giving up.
42. I am not a cheerful optimist.
43. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.
44. I'm hard-headed and tough-minded in my attitudes.
45. Sometimes I'm not as dependable or reliable as I should be.
46. I am seldom sad or depressed.
47. My life is fast-paced.
48. I have little interest in speculating on the nature of the universe or the human condition.
49. I generally try to be thoughtful and considerate.
50. I am a productive person who always gets the job done.
51. I often feel helpless and want someone else to solve my problems.
52. I am a very active person.
53. I have a lot of intellectual curiosity.
54. If I don't like people, I let them know it.
55. I never seem to be able to get organized.
56. At times I have been so ashamed I just wanted to hide.
57. I would rather go my own way than be a leader of others.
58. I often enjoy playing with theories or abstract ideas.
59. If necessary, I am willing to manipulate people to get what I want.
60. I strive for excellence in everything I do.

Enter your responses here—remember to enter responses across the rows.

SD = Strongly Disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly Agree

1 (SD) (D) (N) (A) (SA)	2 (SD) (D) (N) (A) (SA)	3 (SD) (D) (N) (A) (SA)	4 (SD) (D) (N) (A) (SA)	5 (SD) (D) (N) (A) (SA)
6 (SD) (D) (N) (A) (SA)	7 (SD) (D) (N) (A) (SA)	8 (SD) (D) (N) (A) (SA)	9 (SD) (D) (N) (A) (SA)	10 (SD) (D) (N) (A) (SA)
11 (SD) (D) (N) (A) (SA)	12 (SD) (D) (N) (A) (SA)	13 (SD) (D) (N) (A) (SA)	14 (SD) (D) (N) (A) (SA)	15 (SD) (D) (N) (A) (SA)
16 (SD) (D) (N) (A) (SA)	17 (SD) (D) (N) (A) (SA)	18 (SD) (D) (N) (A) (SA)	19 (SD) (D) (N) (A) (SA)	20 (SD) (D) (N) (A) (SA)
21 (SD) (D) (N) (A) (SA)	22 (SD) (D) (N) (A) (SA)	23 (SD) (D) (N) (A) (SA)	24 (SD) (D) (N) (A) (SA)	25 (SD) (D) (N) (A) (SA)
26 (SD) (D) (N) (A) (SA)	27 (SD) (D) (N) (A) (SA)	28 (SD) (D) (N) (A) (SA)	29 (SD) (D) (N) (A) (SA)	30 (SD) (D) (N) (A) (SA)
31 (SD) (D) (N) (A) (SA)	32 (SD) (D) (N) (A) (SA)	33 (SD) (D) (N) (A) (SA)	34 (SD) (D) (N) (A) (SA)	35 (SD) (D) (N) (A) (SA)
36 (SD) (D) (N) (A) (SA)	37 (SD) (D) (N) (A) (SA)	38 (SD) (D) (N) (A) (SA)	39 (SD) (D) (N) (A) (SA)	40 (SD) (D) (N) (A) (SA)
41 (SD) (D) (N) (A) (SA)	42 (SD) (D) (N) (A) (SA)	43 (SD) (D) (N) (A) (SA)	44 (SD) (D) (N) (A) (SA)	45 (SD) (D) (N) (A) (SA)
46 (SD) (D) (N) (A) (SA)	47 (SD) (D) (N) (A) (SA)	48 (SD) (D) (N) (A) (SA)	49 (SD) (D) (N) (A) (SA)	50 (SD) (D) (N) (A) (SA)
51 (SD) (D) (N) (A) (SA)	52 (SD) (D) (N) (A) (SA)	53 (SD) (D) (N) (A) (SA)	54 (SD) (D) (N) (A) (SA)	55 (SD) (D) (N) (A) (SA)
56 (SD) (D) (N) (A) (SA)	57 (SD) (D) (N) (A) (SA)	58 (SD) (D) (N) (A) (SA)	59 (SD) (D) (N) (A) (SA)	60 (SD) (D) (N) (A) (SA)

- Have you responded to all of the statements? _____ Yes _____ No
- Have you entered your responses in the correct boxes? _____ Yes _____ No
- Have you responded accurately and honestly? _____ Yes _____ No

Appendix 4

Tables i to xxxi

Table i Retrospective 'pre-university' responses to sentence stem 1: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	35	28	43	32
'B'	48	38	34	25
'C'	36	29	48	36
No response	7	6	9	7
Total	126	101	134	100

Table ii Retrospective 'pre-university' responses to sentence stem 2: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	31	25	46	34
'B'	36	29	26	19
'C'	50	40	52	39
'BC'	1	1	0	0
No response	8	6	10	8
Total	126	101	134	100

Table iii Retrospective 'pre-university' responses to sentence stem 3:
traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	29	23	28	21
'B'	32	25	37	28
'C'	57	45	59	44
No response	8	6	10	8
Total	126	99	134	101

Table iv Retrospective 'pre-university' responses to sentence stem 4:
traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	62	49	62	46
'B'	27	21	36	27
'C'	30	24	27	20
No response	7	6	9	7
Total	126	100	134	100

Table v Term 1 (Year 1) responses to sentence stem 1: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'B'	52	43	21	16
'C'	68	57	112	84
Total	120	100	133	100

Table vi Term 1 (Year 1) responses to sentence stem 2: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	7	6	4	3
'B'	14	11	5	4
'C'	102	83	119	93
Total	123	100	128	100

Table vii Term 1 (Year 1) responses to sentence stem 3: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	7	6	1	1
'B'	35	29	38	29
'C'	77	65	94	71
Total	119	100	133	101

Table viii Term 1 (Year 1) responses to sentence stem 4: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	54	45	35	27
'B'	28	23	35	27
'C'	39	32	59	46
Total	121	100	129	100

Table ix Term 3 (Year 1) responses to sentence stem 1: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A' or 'B'	49	39	24	18
'C'	77	61	108	82
Total	126	100	132	100

Table x Term 3 (Year 1) responses to sentence stem 2: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	10	8	1	1
'B'	34	27	11	8
'C'	82	65	120	90
Total	126	100	132	99

Table xi Term 3 (Year 1) responses to sentence stem 3: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	11	9	3	2
'B'	45	36	38	29
'C'	69	55	90	69
Total	125	100	131	100

Table xii Term 3 (Year 1) responses to sentence stem 4: traditional and PBL students

<i>Type of response to sentence stem</i>	Traditional students		PBL students	
	n	%	n	%
'A'	56	44	25	19
'B'	39	31	25	19
'C'	31	25	81	62
Total	126	100	131	100

Table xiii Extent of first year changes in students' perceptions of the student role

<i>Extent of change</i>	Traditional students		PBL students	
	n	%	n	%
<i>AA: No change</i>	0	0	0	0
<i>BB: No change</i>	25	21	7	5
<i>CC: No change</i>	48	40	96	72
<i>Change forwards (AB or AC or BC)</i>	26	22	13	10
<i>Change backwards (CB or CA or BA)</i>	22	18	17	13
Total	121	101	133	100

Table xiv Extent of first year changes in students' perceptions of the role of lecturer/member of staff

<i>Extent of change</i>	Traditional students		PBL students	
	n	%	n	%
<i>AA: No change</i>	2	2	1	1
<i>BB: No change</i>	8	6	2	2
<i>CC: No change</i>	72	58	111	87
<i>Change forwards (AB or AC or BC)</i>	10	8	6	5
<i>Change backwards (CB or CA or BA)</i>	31	25	7	5
Total	123	99	127	100

Note: The chi-square analysis of the data in this table was unlikely to be valid because the number of cells with an expected frequency <5 exceeded 20%.

Table xv Extent of first year changes in students' perceptions of the nature of knowledge

<i>Extent of change</i>	Traditional students		PBL students	
	n	%	n	%
<i>AA: No change</i>	4	3	0	0
<i>BB: No change</i>	18	15	21	16
<i>CC: No change</i>	52	44	76	58
<i>Change forwards (AB or AC or BC)</i>	16	14	14	11
<i>Change backwards (CB or CA or BA)</i>	28	24	19	15
Total	118	100	130	100

Table xvi Extent of first year changes in students' perceptions of their task in exams/assessments

<i>Extent of change</i>	Traditional students		PBL students	
	n	%	n	%
<i>AA: No change</i>	31	26	15	12
<i>BB: No change</i>	14	12	10	8
<i>CC: No change</i>	12	10	45	35
<i>AB: Change forwards</i>	13	11	4	3
<i>AC: Change forwards</i>	10	8	16	13
<i>BC: Change forwards</i>	6	5	19	15
<i>BA: Change backwards</i>	8	7	5	4
<i>CA: Change backwards</i>	16	13	4	3
<i>CB: Change backwards</i>	11	9	9	7
Total	121	101	127	100

Table xvii Changes in students' responses during first year to Likert-type statement No. 1

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	4	3	36	27
<i>Neutral: No change</i>	6	5	18	14
<i>Agree: No change</i>	74	59	19	14
<i>Changed to Disagree (from Agree or Neutral)</i>	5	4	23	17
<i>Changed to Neutral (from Agree or Disagree)</i>	16	13	15	11
<i>Changed to Agree (from Disagree or Neutral)</i>	20	16	21	16
Total	125	100	132	99

Table xviii Changes in students' responses during first year to Likert-type statement No. 4

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	65	52	85	65
<i>Neutral: No change</i>	12	10	7	5
<i>Agree: No change</i>	6	5	3	2
<i>Changed to Disagree (from Agree or Neutral)</i>	19	15	8	6
<i>Changed to Neutral (from Agree or Disagree)</i>	13	10	21	16
<i>Changed to Agree (from Disagree or Neutral)</i>	11	9	6	5
Total	126	101	130	99

Table xix Changes in students' responses during first year to Likert-type statement No. 7

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	46	37	78	59
<i>Neutral: No change</i>	11	9	4	3
<i>Agree: No change</i>	8	6	1	1
<i>Changed to Disagree (from Agree or Neutral)</i>	26	21	10	8
<i>Changed to Neutral (from Agree or Disagree)</i>	22	18	31	23
<i>Changed to Agree (from Disagree or Neutral)</i>	11	9	9	7
Total	124	100	133	101

Table xx Changes in students' responses during first year to Likert-type statement No. 10

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	48	39	82	62
<i>Neutral: No change</i>	9	7	9	7
<i>Agree: No change</i>	10	8	3	2
<i>Changed to Disagree (from Agree or Neutral)</i>	21	17	20	15
<i>Changed to Neutral (from Agree or Disagree)</i>	23	18	15	11
<i>Changed to Agree (from Disagree or Neutral)</i>	13	10	4	3
Total	124	99	133	100

Table xxi Changes in students' responses during first year to Likert-type statement No. 13

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	50	41	64	48
<i>Neutral: No change</i>	15	12	16	12
<i>Agree: No change</i>	7	6	3	2
<i>Changed to Disagree (from Agree or Neutral)</i>	31	25	20	15
<i>Changed to Neutral (from Agree or Disagree)</i>	13	11	22	16
<i>Changed to Agree (from Disagree or Neutral)</i>	7	6	9	7
Total	123	101	134	100

Table xxii Changes in students' responses during first year to Likert-type statement No. 3

<i>Extent of change in student response, Term 1 – Term 3</i>	<i>Traditional students</i>		<i>PBL students</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
<i>Disagree: No change</i>	4	3	2	1
<i>Neutral: No change</i>	4	3	6	4
<i>Agree: No change</i>	78	62	86	64
<i>Changed to Disagree (from Agree or Neutral)</i>	8	6	5	4
<i>Changed to Neutral (from Agree or Disagree)</i>	12	10	13	10
<i>Changed to Agree (from Disagree or Neutral)</i>	20	16	22	16
Total	126	100	134	99

Note: The chi-square analysis of the data in this table was unlikely to be valid because the number of cells with an expected frequency <5 exceeded 20%.

Table xxiii Changes in students' responses during first year to Likert-type statement No. 6

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	10	8	8	6
<i>Neutral: No change</i>	19	16	10	8
<i>Agree: No change</i>	38	31	60	46
<i>Changed to Disagree (from Agree or Neutral)</i>	16	13	10	8
<i>Changed to Neutral (from Agree or Disagree)</i>	24	20	16	12
<i>Changed to Agree (from Disagree or Neutral)</i>	15	12	26	20
Total	122	100	130	100

Table xxiv Changes in students' responses during first year to Likert-type statement No. 9

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	41	33	30	22
<i>Neutral: No change</i>	25	20	23	17
<i>Agree: No change</i>	7	6	15	11
<i>Changed to Disagree (from Agree or Neutral)</i>	21	17	27	20
<i>Changed to Neutral (from Agree or Disagree)</i>	24	19	23	17
<i>Changed to Agree (from Disagree or Neutral)</i>	6	5	16	12
Total	124	100	134	99

Table xxv Changes in students' responses during first year to Likert-type statement No. 12

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	5	4	2	1
<i>Neutral: No change</i>	30	24	20	15
<i>Agree: No change</i>	32	26	56	42
<i>Changed to Disagree (from Agree or Neutral)</i>	12	10	3	2
<i>Changed to Neutral (from Agree or Disagree)</i>	31	25	38	28
<i>Changed to Agree (from Disagree or Neutral)</i>	13	11	15	11
Total	123	100	134	99

Table xxvi Changes in students' responses during first year to Likert-type statement No. 15

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	7	6	1	1
<i>Neutral: No change</i>	9	7	1	1
<i>Agree: No change</i>	61	49	109	83
<i>Changed to Disagree (from Agree or Neutral)</i>	13	10	4	3
<i>Changed to Neutral (from Agree or Disagree)</i>	22	18	14	11
<i>Changed to Agree (from Disagree or Neutral)</i>	13	10	3	2
Total	125	100	132	101

Table xxvii Changes in students' responses during first year to Likert-type statement No. 2

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	14	11	6	4
<i>Neutral: No change</i>	21	17	10	8
<i>Agree: No change</i>	24	20	50	38
<i>Changed to Disagree (from Agree or Neutral)</i>	18	15	16	12
<i>Changed to Neutral (from Agree or Disagree)</i>	28	23	27	20
<i>Changed to Agree (from Disagree or Neutral)</i>	18	15	23	17
Total	123	101	132	99

Table xxviii Changes in students' responses during first year to Likert-type statement No. 5

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	24	19	2	1
<i>Neutral: No change</i>	15	12	7	5
<i>Agree: No change</i>	30	24	14	10
<i>Changed to Disagree (from Agree or Neutral)</i>	6	5	4	3
<i>Changed to Neutral (from Agree or Disagree)</i>	17	14	12	9
<i>Changed to Agree (from Disagree or Neutral)</i>	34	27	95	71
Total	126	101	134	99

Table xxix Changes in students' responses during first year to Likert-type statement No. 8

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	29	23	46	35
<i>Neutral: No change</i>	10	8	13	10
<i>Agree: No change</i>	25	20	17	13
<i>Changed to Disagree (from Agree or Neutral)</i>	14	11	11	8
<i>Changed to Neutral (from Agree or Disagree)</i>	29	23	27	20
<i>Changed to Agree (from Disagree or Neutral)</i>	18	14	18	14
Total	125	99	132	100

Table xxx Changes in students' responses during first year to Likert-type statement No. 11

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	4	3	0	0
<i>Neutral: No change</i>	5	4	1	1
<i>Agree: No change</i>	77	62	94	70
<i>Changed to Disagree (from Agree or Neutral)</i>	8	6	9	7
<i>Changed to Neutral (from Agree or Disagree)</i>	20	16	9	7
<i>Changed to Agree (from Disagree or Neutral)</i>	10	8	21	16
Total	124	99	134	101

Note: The chi-square analysis of the data in this table was unlikely to be valid because the number of cells with an expected frequency <5 exceeded 20%.

Table xxxi Changes in students' responses during first year to Likert-type statement No. 14

<i>Extent of change in student response, Term 1 – Term 3</i>	Traditional students		PBL students	
	n	%	n	%
<i>Disagree: No change</i>	9	7	13	10
<i>Neutral: No change</i>	15	12	18	14
<i>Agree: No change</i>	39	32	33	25
<i>Changed to Disagree (from Agree or Neutral)</i>	12	10	20	15
<i>Changed to Neutral (from Agree or Disagree)</i>	10	8	21	16
<i>Changed to Agree (from Disagree or Neutral)</i>	38	31	28	21
Total	123	100	133	101

Appendix 5

NEO-FFI: Mean Scores of Male and Female Students in the Traditional and PBL courses

Male and female students in the traditional and PBL courses: mean scores on *NEO Five-Factor Inventory*

Personality Dimension	Max. Poss. Score	Traditional course				PBL course			
		Male		Female		Male		Female	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Openness to Experience</i>	48	30	6.1	30	5.8	30	6.7	30	5.8
<i>Agreeableness</i>	48	26	6.4	31	5.3	31	7.2	32	5.8
<i>Conscientiousness</i>	48	28	7.7	28	5.8	28	8.1	31	7.3
<i>Extraversion</i>	48	30	6.6	30	6.2	32	7.0	32	5.3
<i>Neuroticism</i>	48	23	8.9	24	8.8	16	7.2	21	8.6

College-age norms for *NEO Five-Factor Inventory Scales*
(Adapted from Costa and McCrae, 1992: 78)

Personality dimension	Male		Female	
	Mean	SD	Mean	SD
<i>Openness to experience</i>	27.6	6.1	27.9	5.7
<i>Agreeableness</i>	28.8	5.2	31.0	5.3
<i>Conscientiousness</i>	30.2	7.2	31.0	6.5
<i>Extraversion</i>	29.2	6.0	31.3	5.6
<i>Neuroticism</i>	22.5	7.9	25.8	7.6

Appendix 6

Bar Charts: Interviewees' responses to checklist on approaches to studying

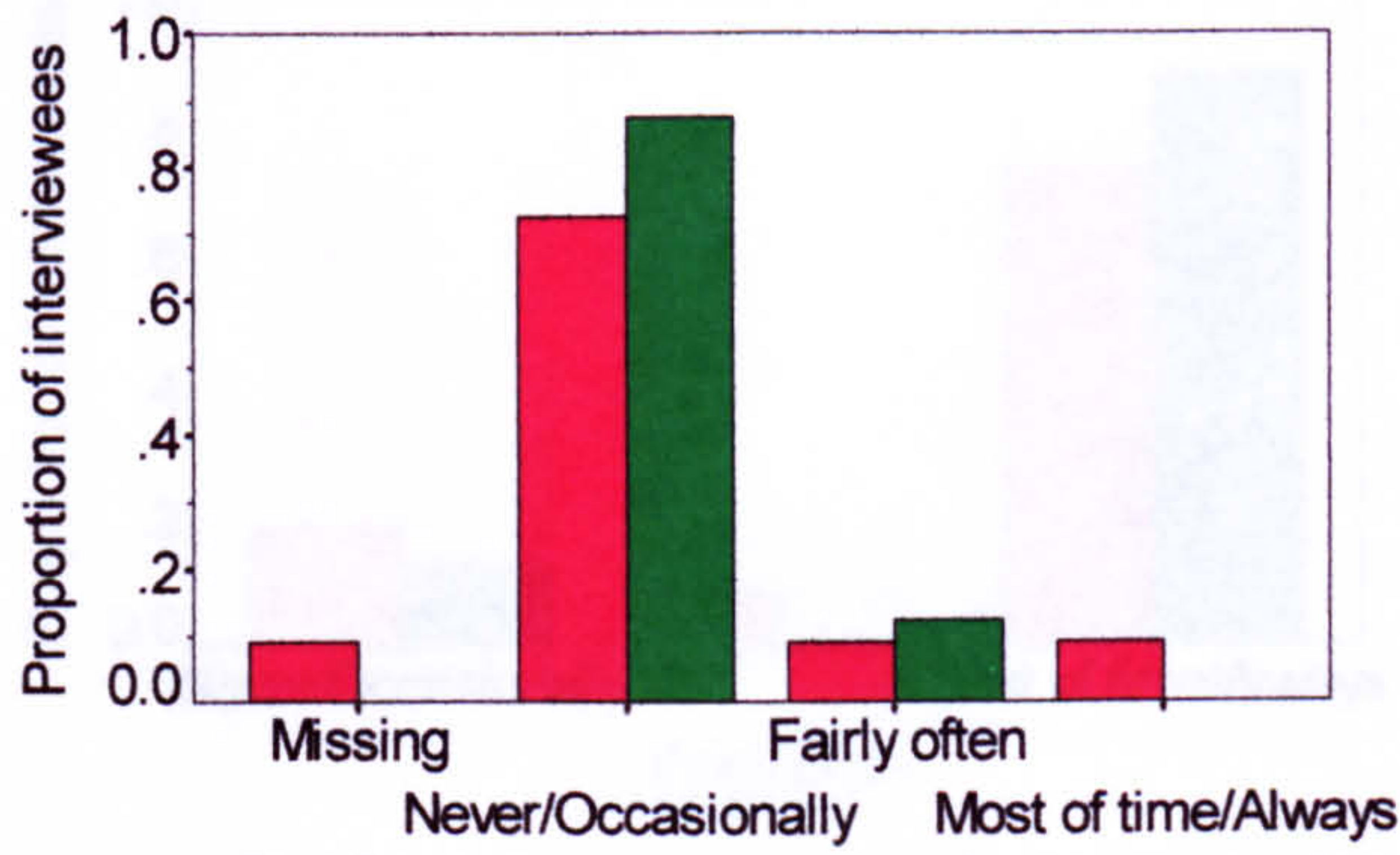


Fig. 48 'I have no specific plan for revision...'

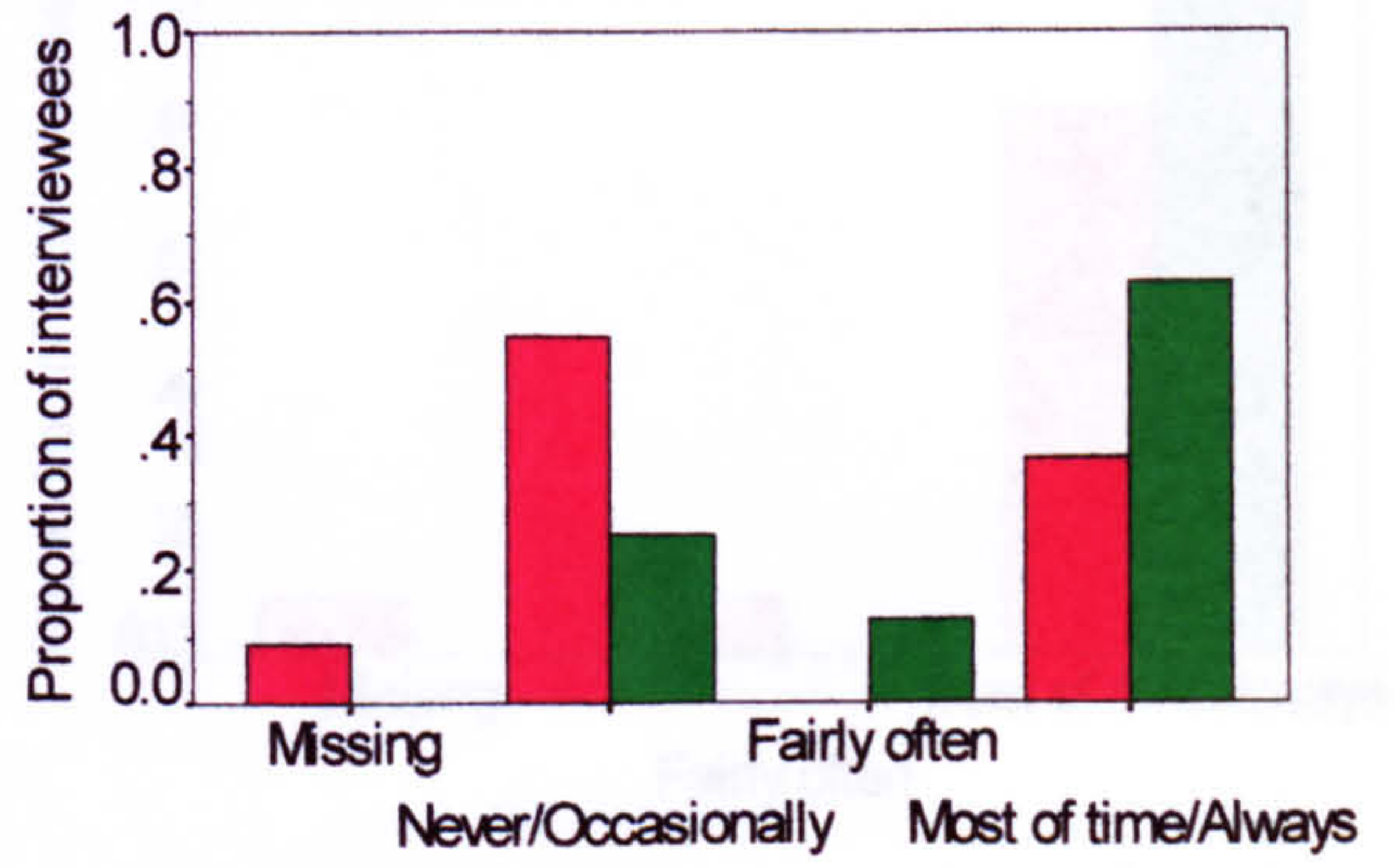


Fig. 49 'I write down a schedule for revision.'

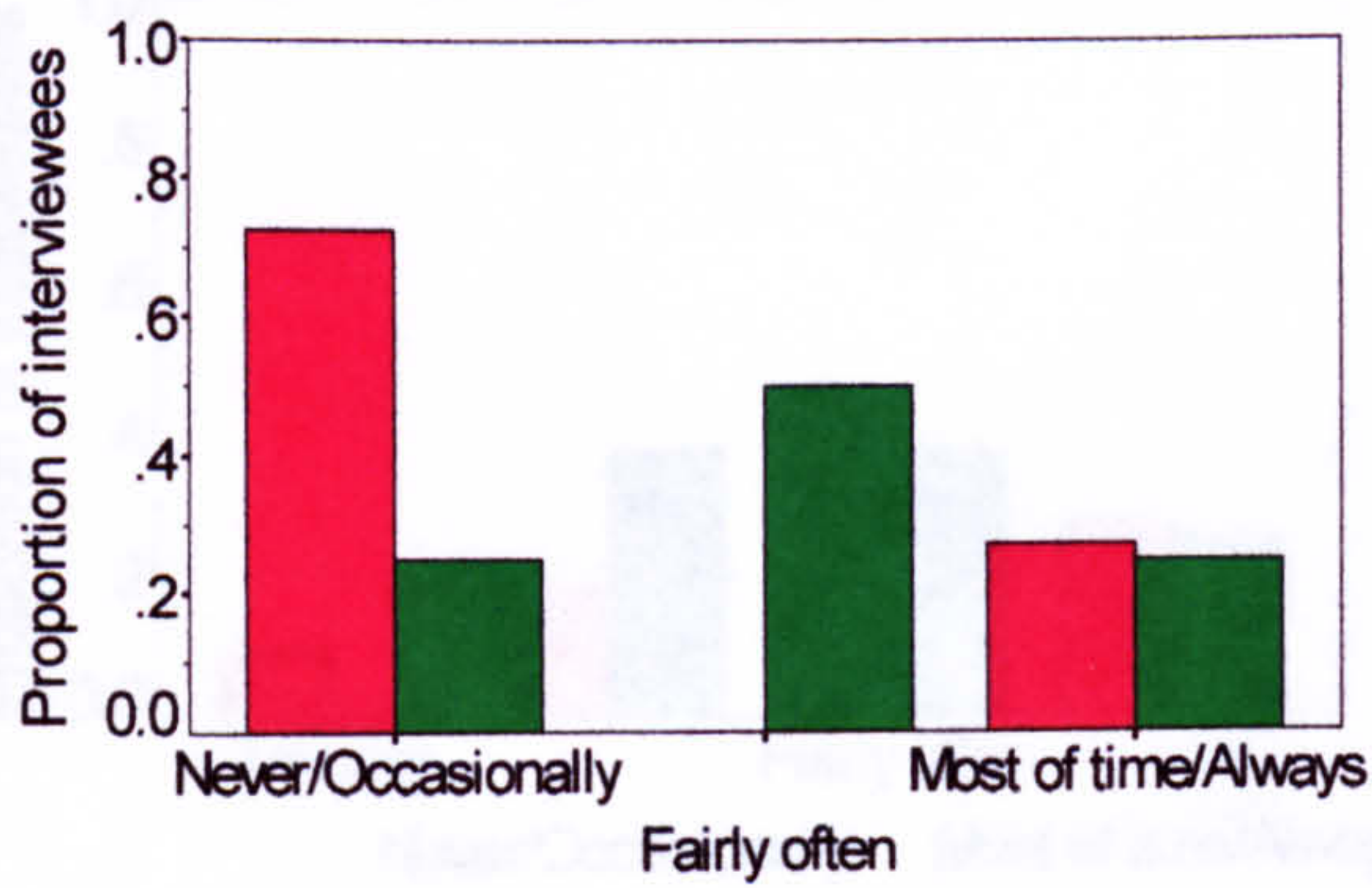


Fig. 50 'I stick to a revision schedule.'

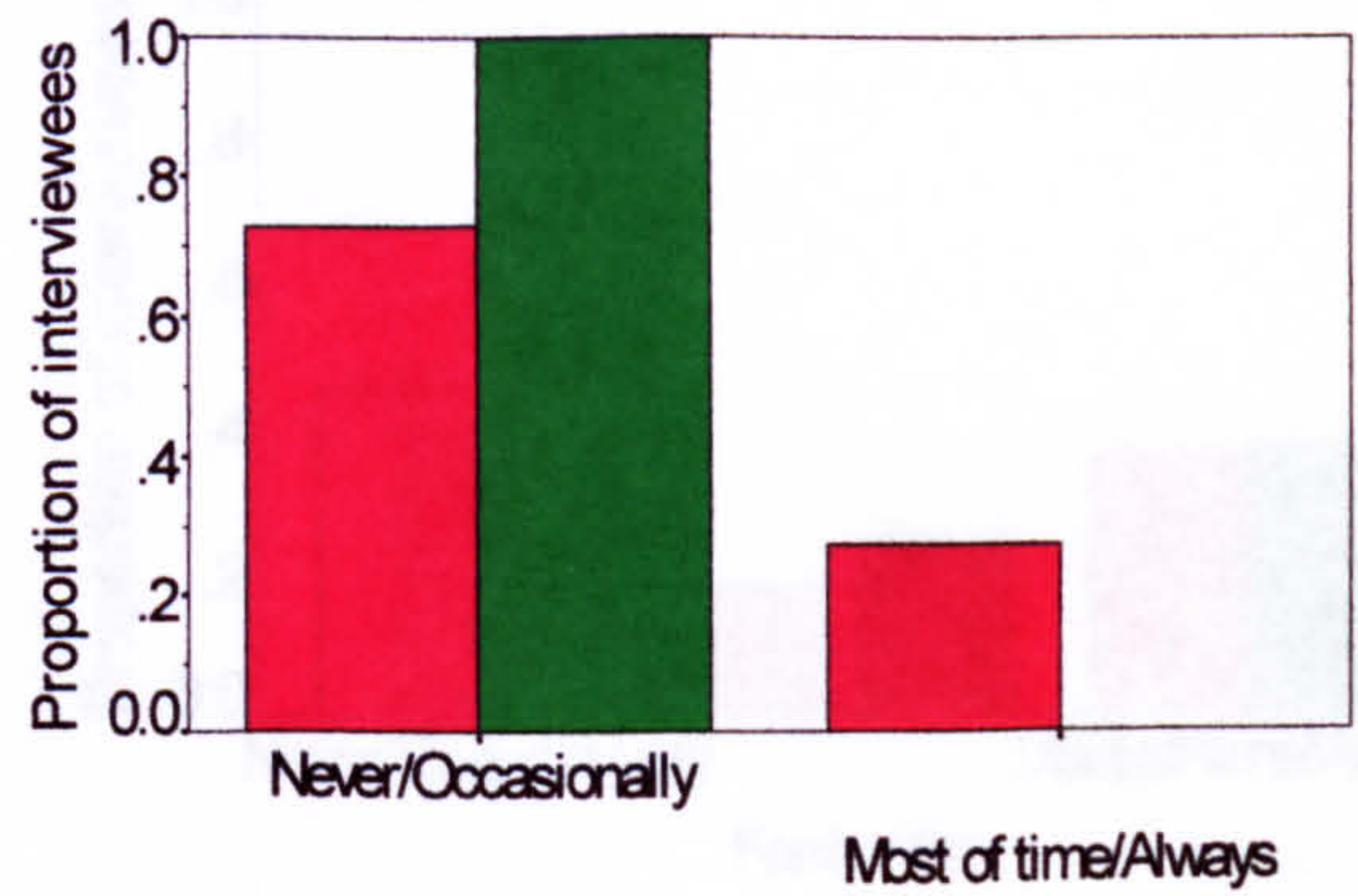


Fig. 51 'I cram for exams...'

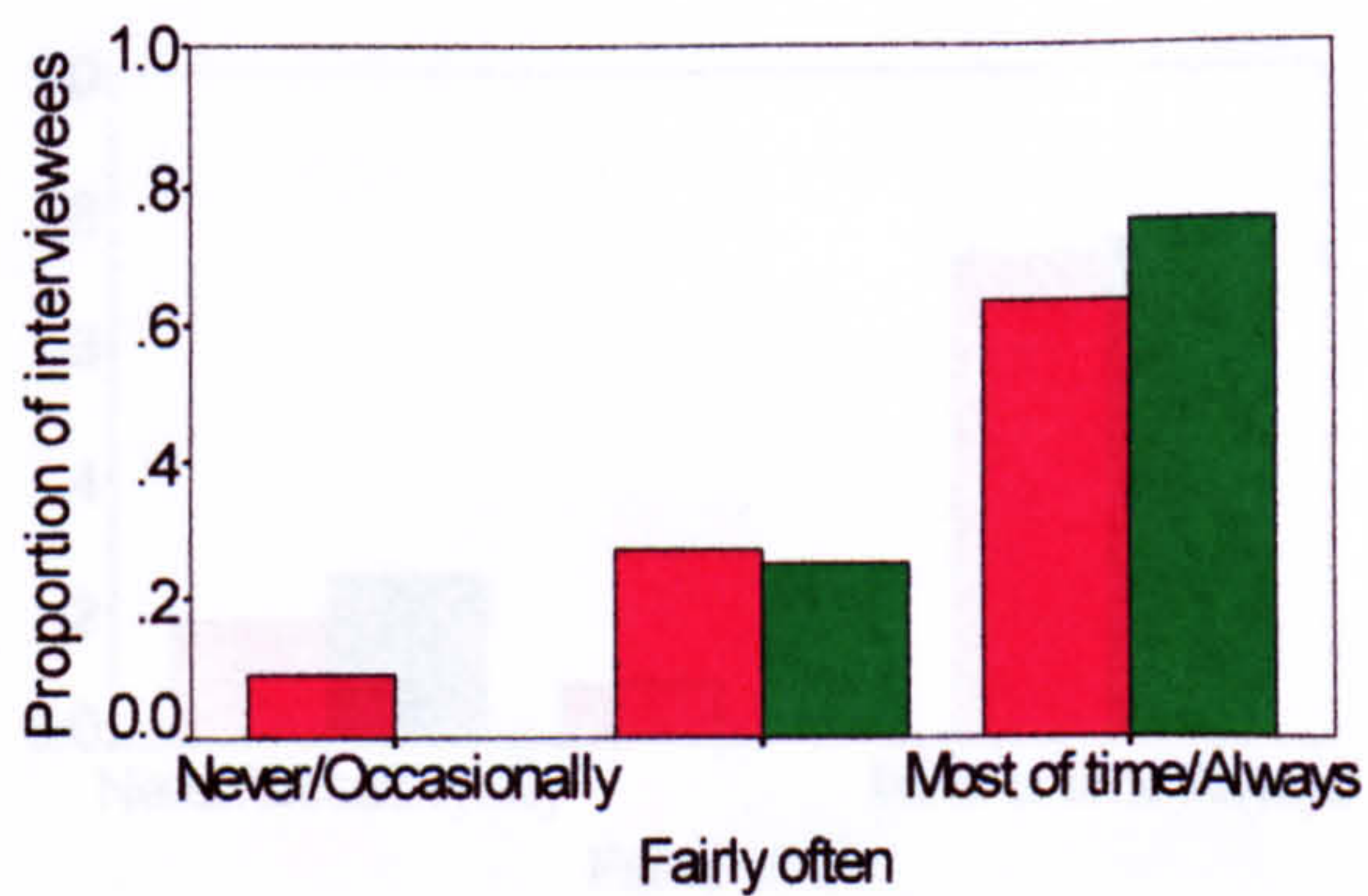


Fig. 52 'I set targets during my revision.'

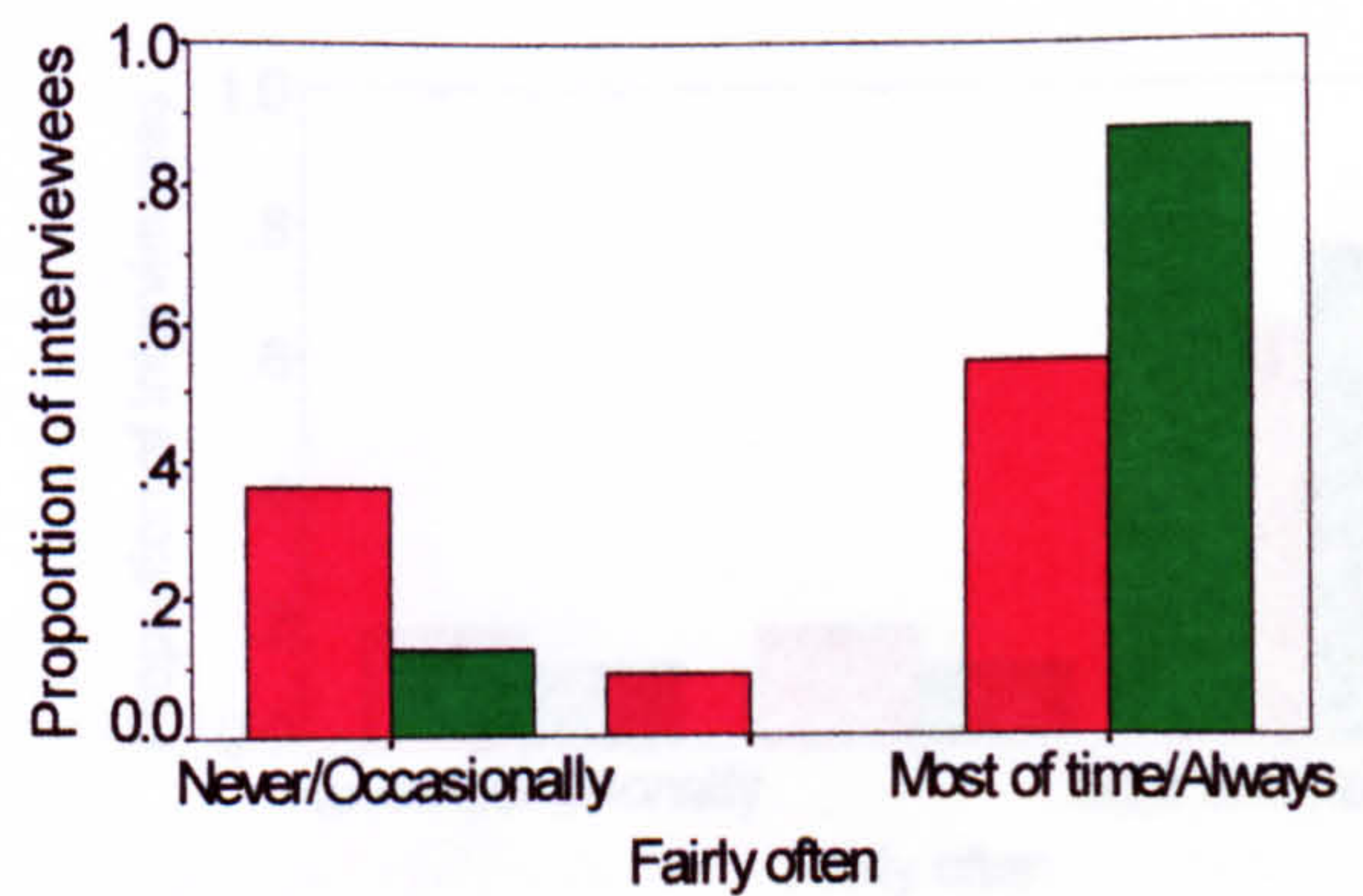


Fig. 53 'I begin to revise...some weeks before.'

■ Interviewees in traditional course
■ Interviewees in PBL course

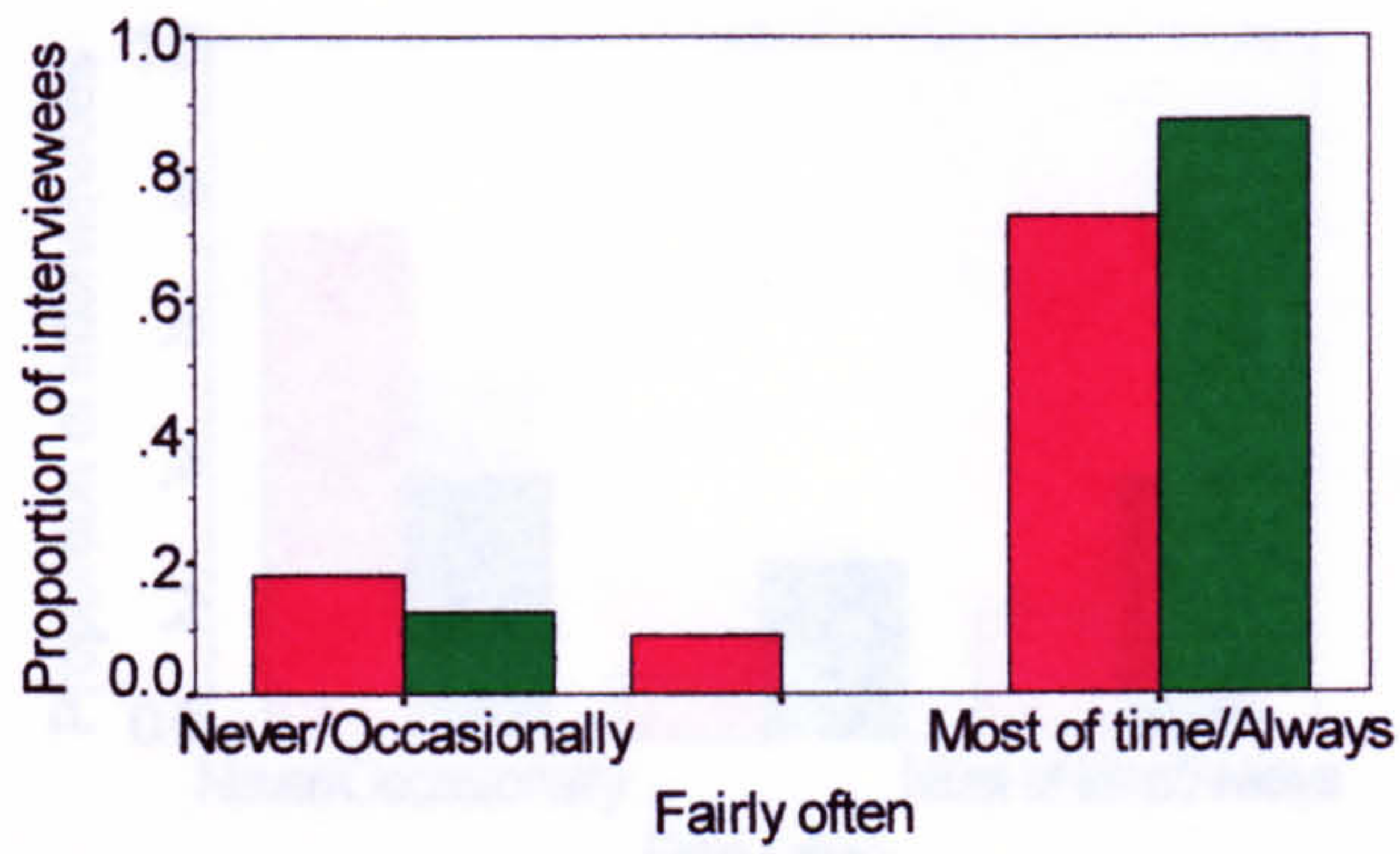


Fig. 54 'I read over...course/lecture notes.'

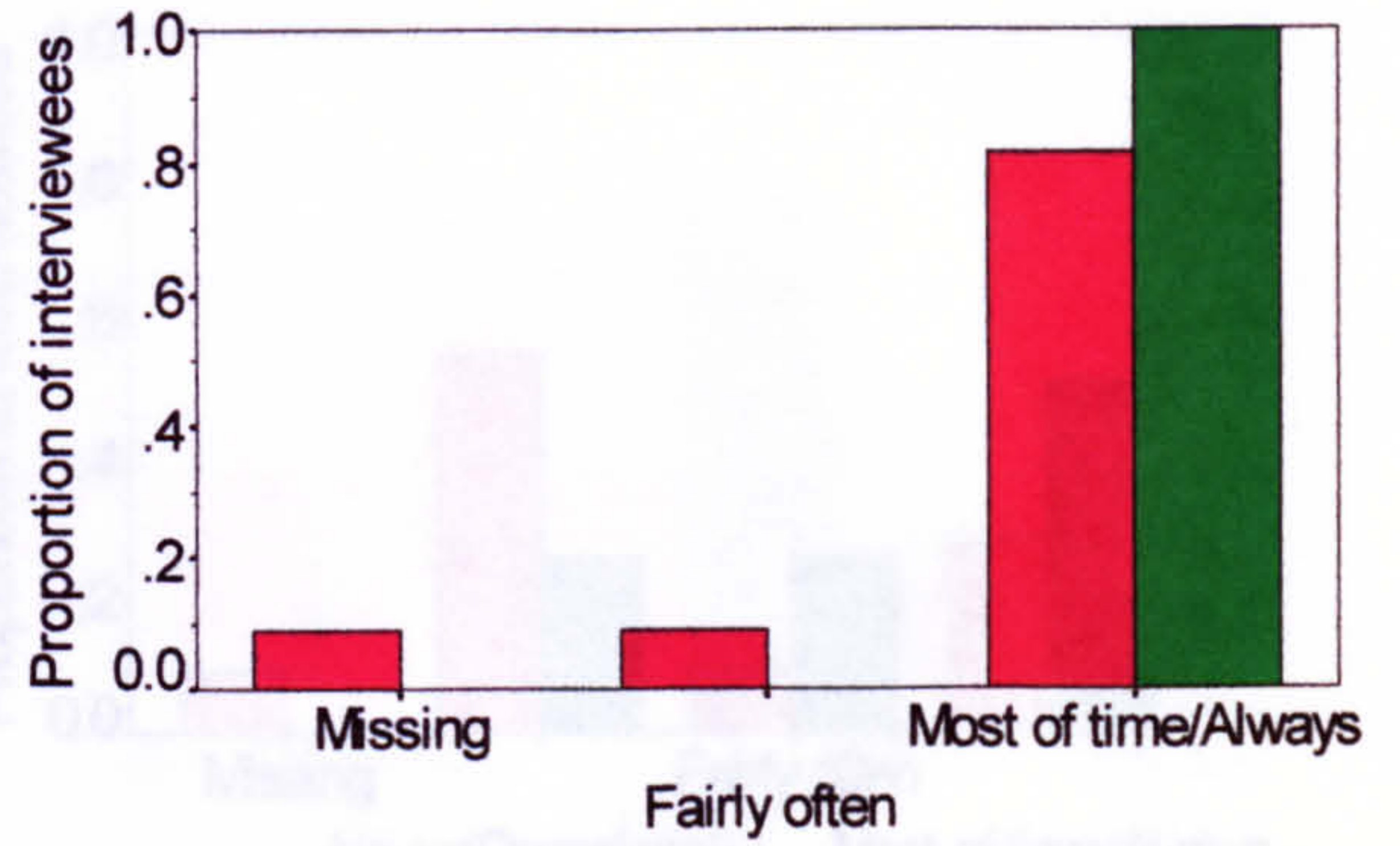


Fig. 55 'I read recommended textbooks.'

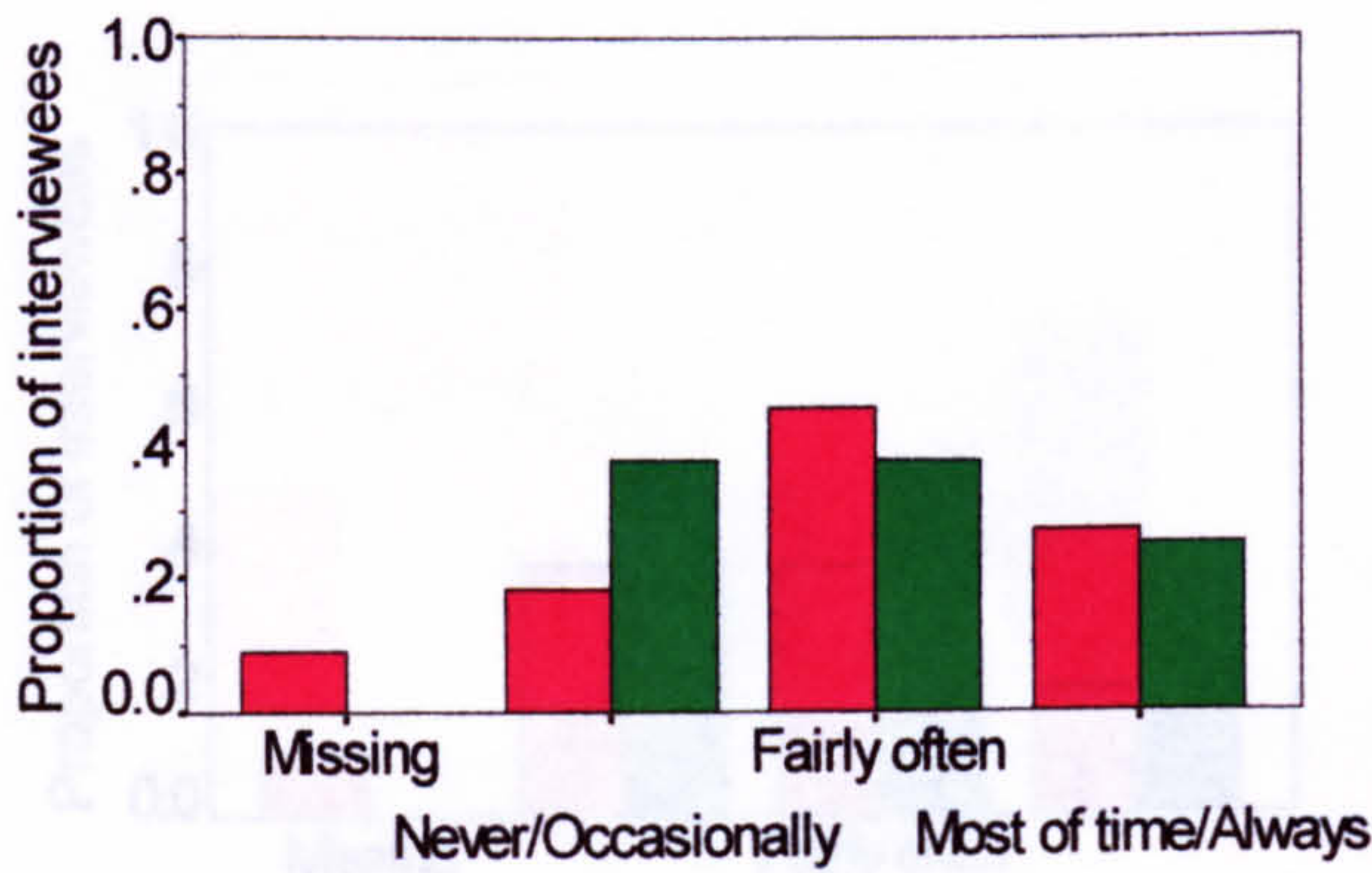


Fig. 56 'I read around the subjects.'



Fig. 57 'I...learn most of the material "off by heart".'

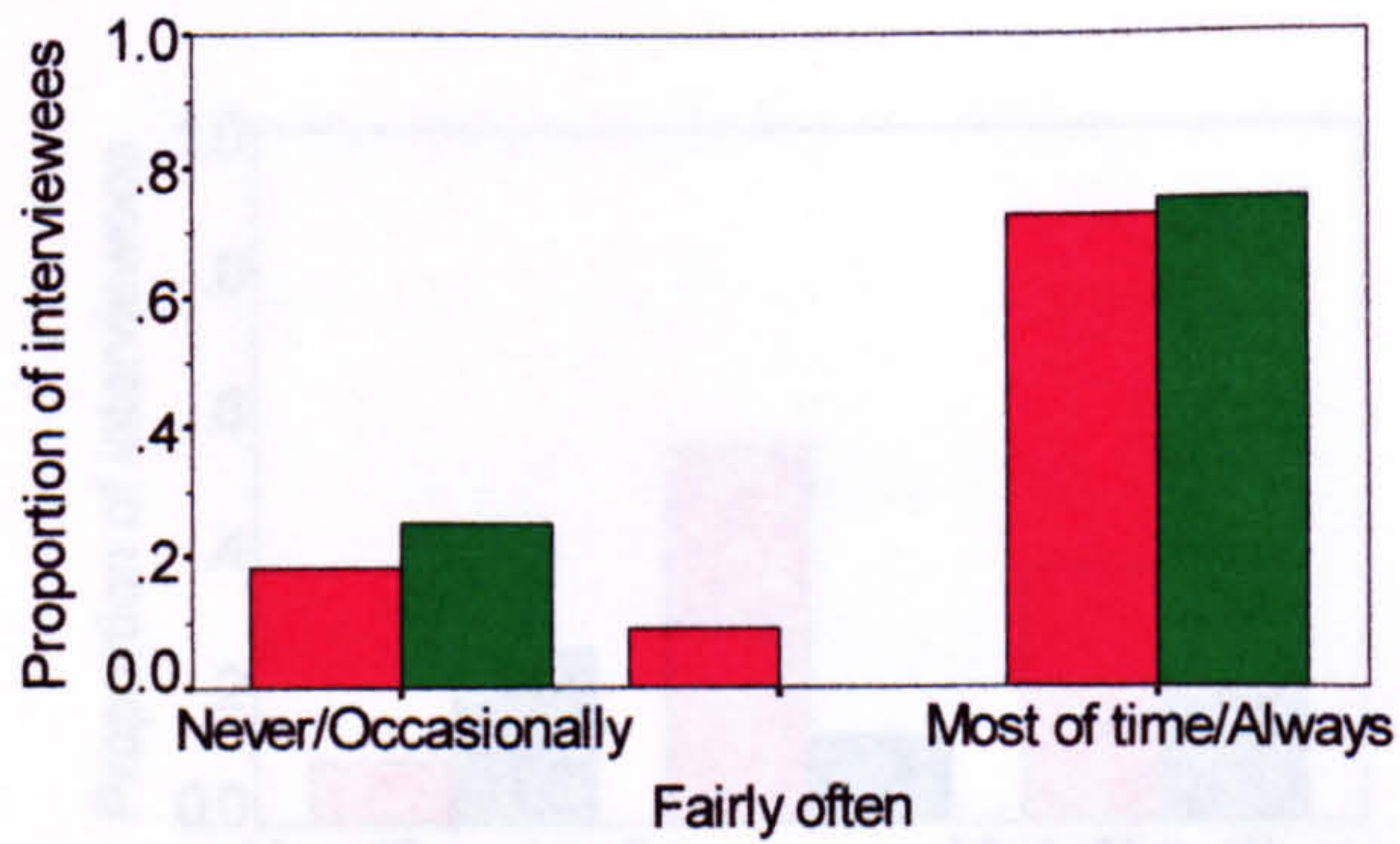


Fig. 58 'As I read..., I write down...important points.'

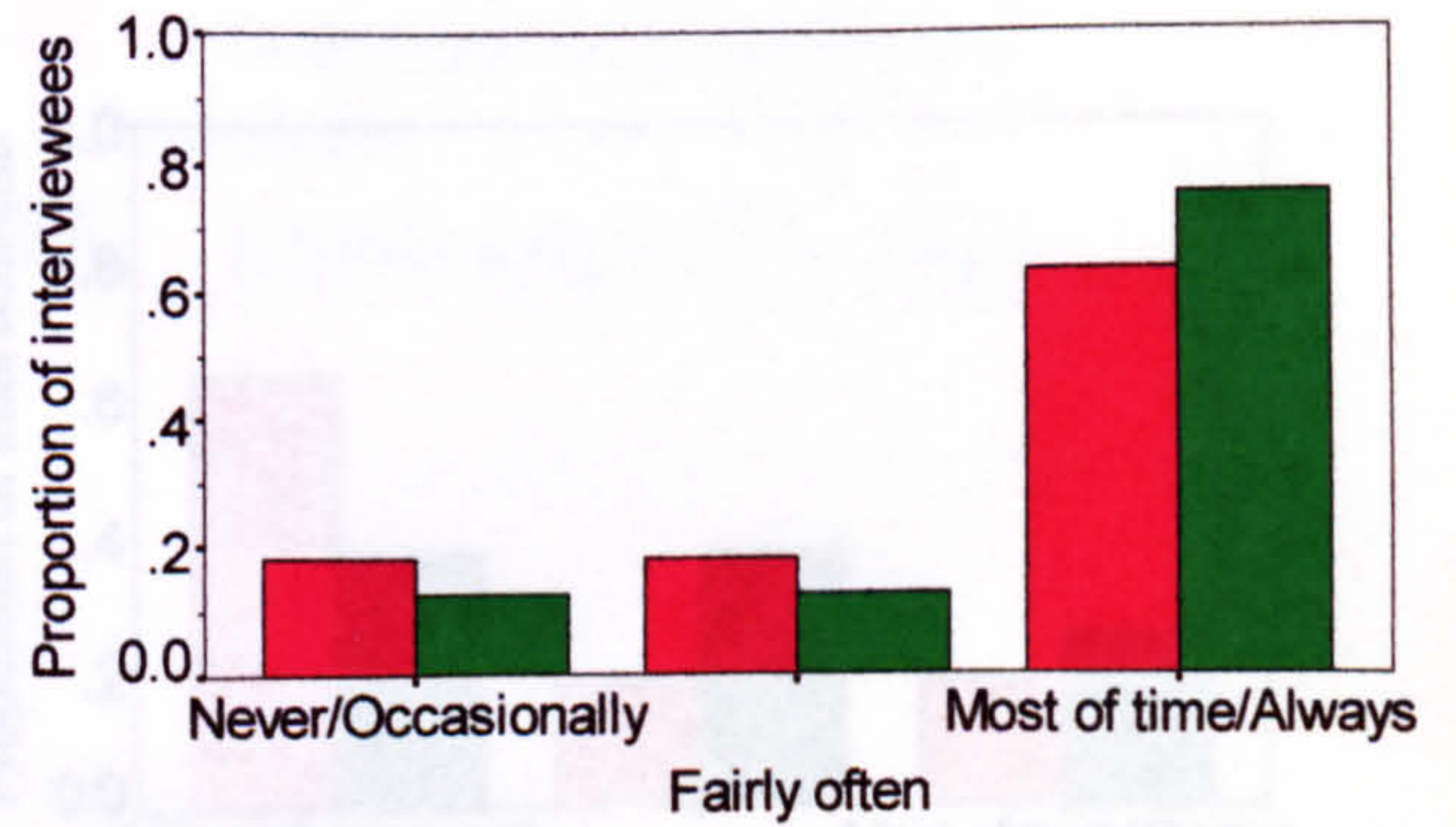


Fig. 59 'I underline/highlight...in my notes.'

■ Interviewees in traditional course
■ Interviewees in PBL course



Fig. 60 'I select specific areas for revision...'

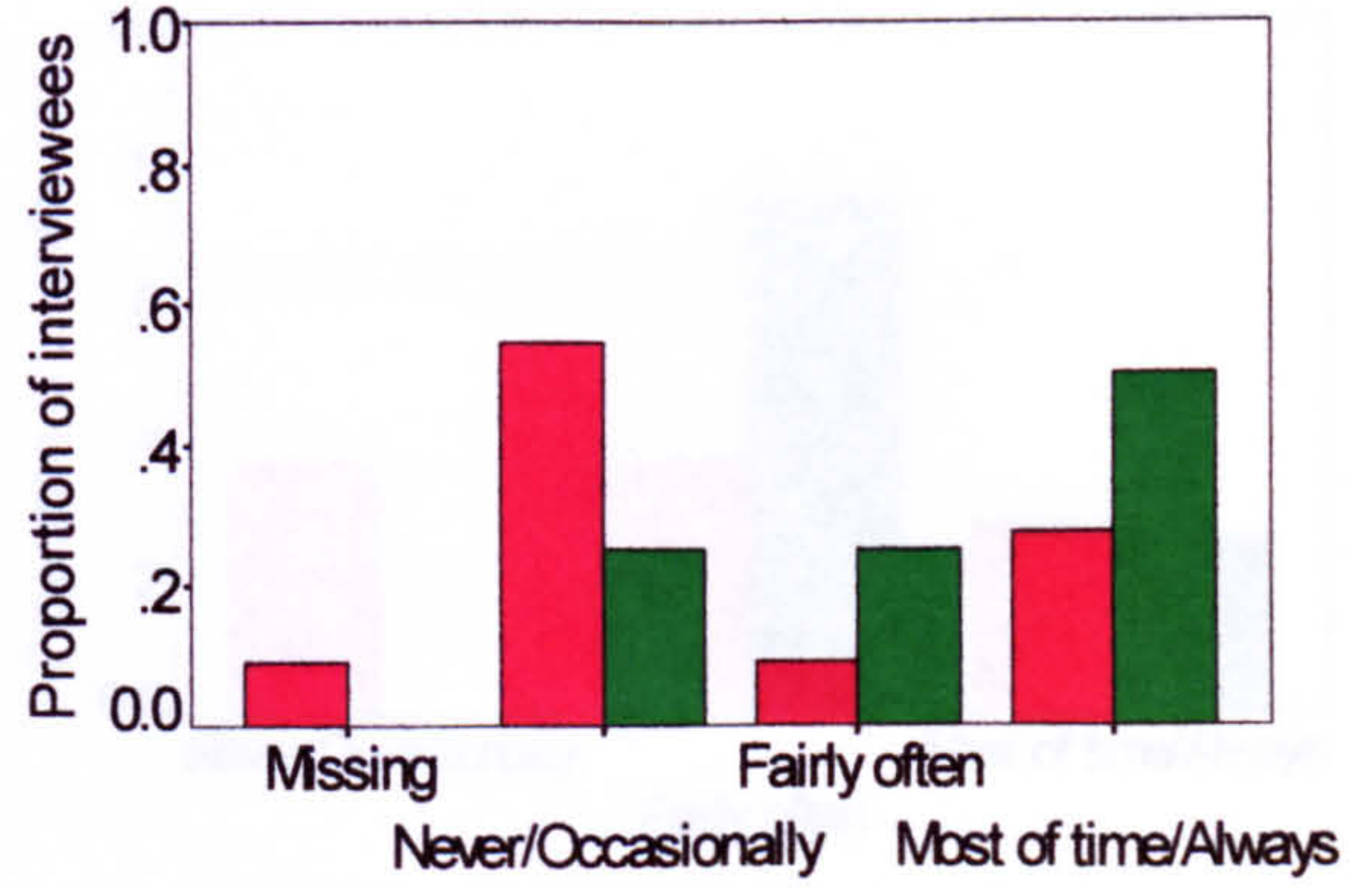


Fig. 61 'I make summaries of my notes on each topic.'

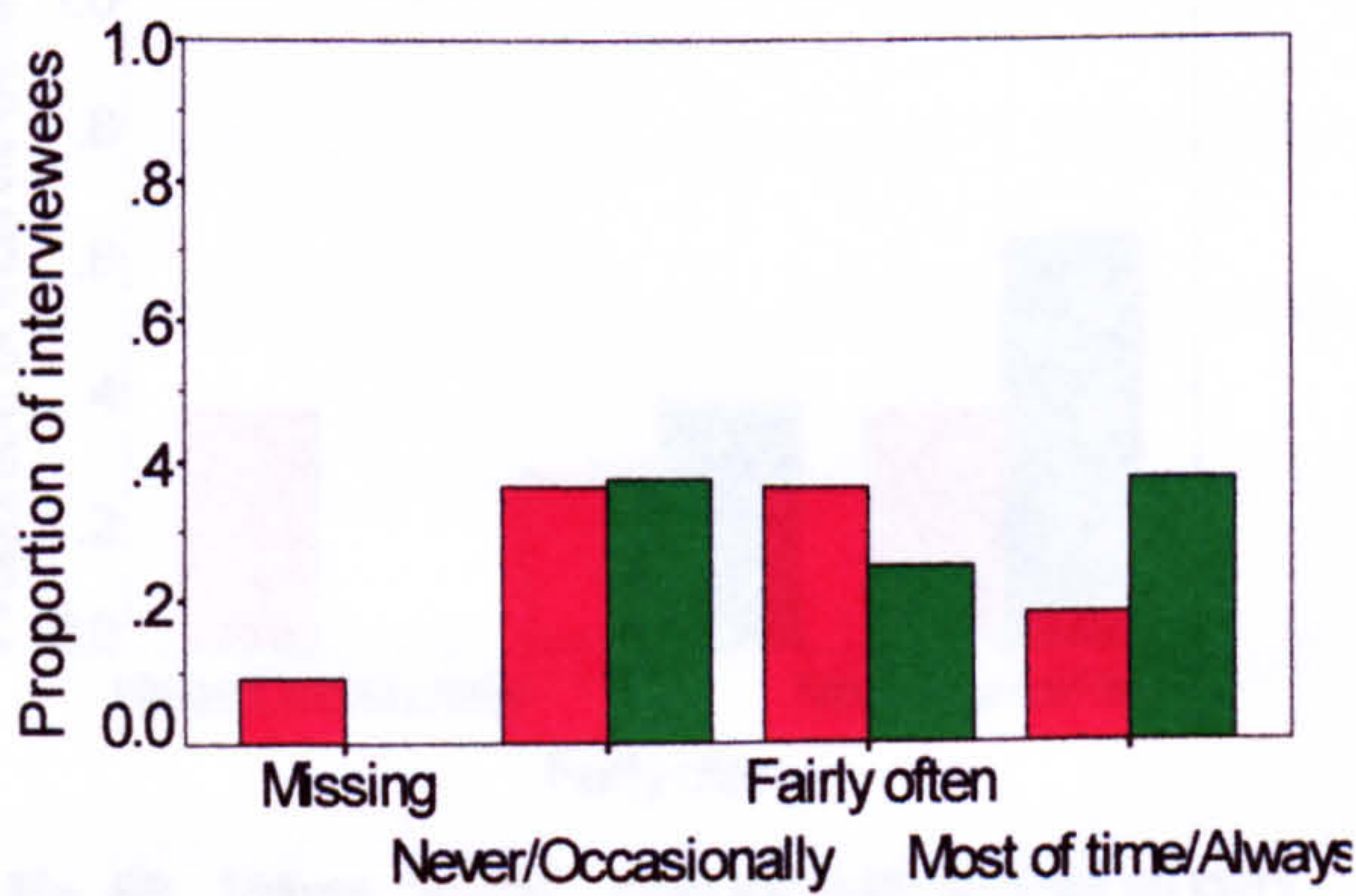


Fig. 62 'I use mnemonics.'

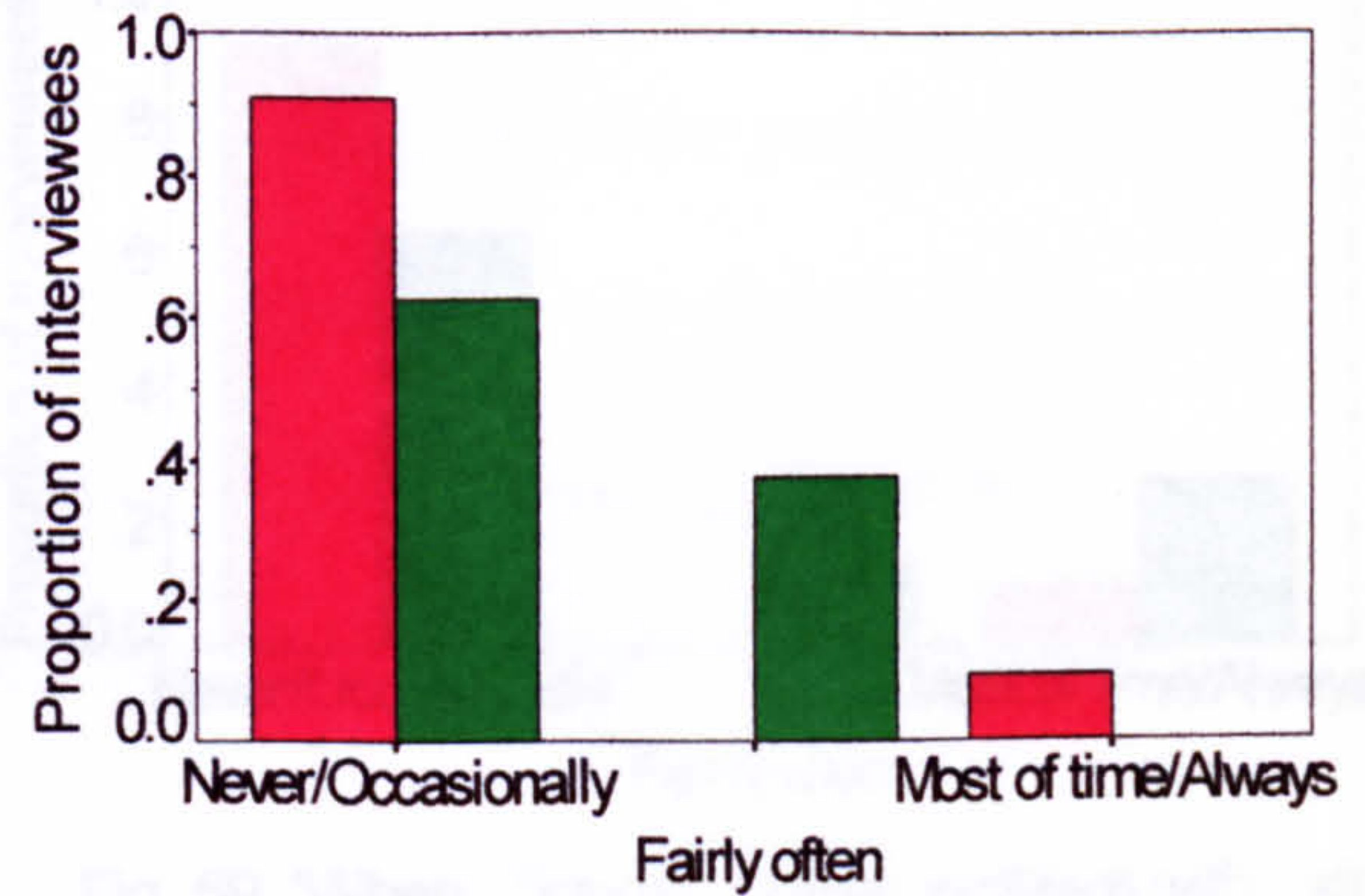


Fig. 63 '...I organise..important headings..into lists.'

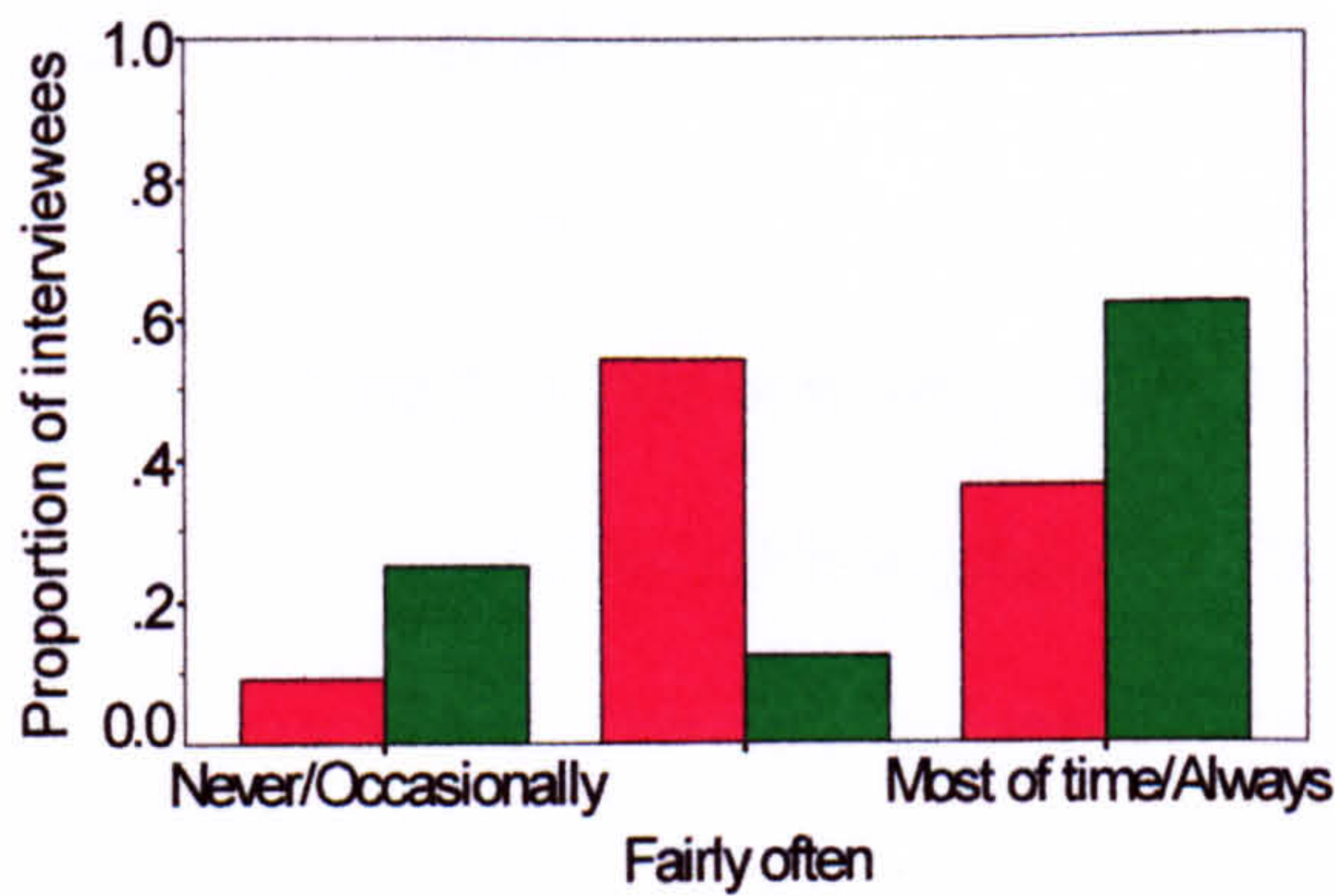


Fig.64 '...link..with what I..know..past experience.'

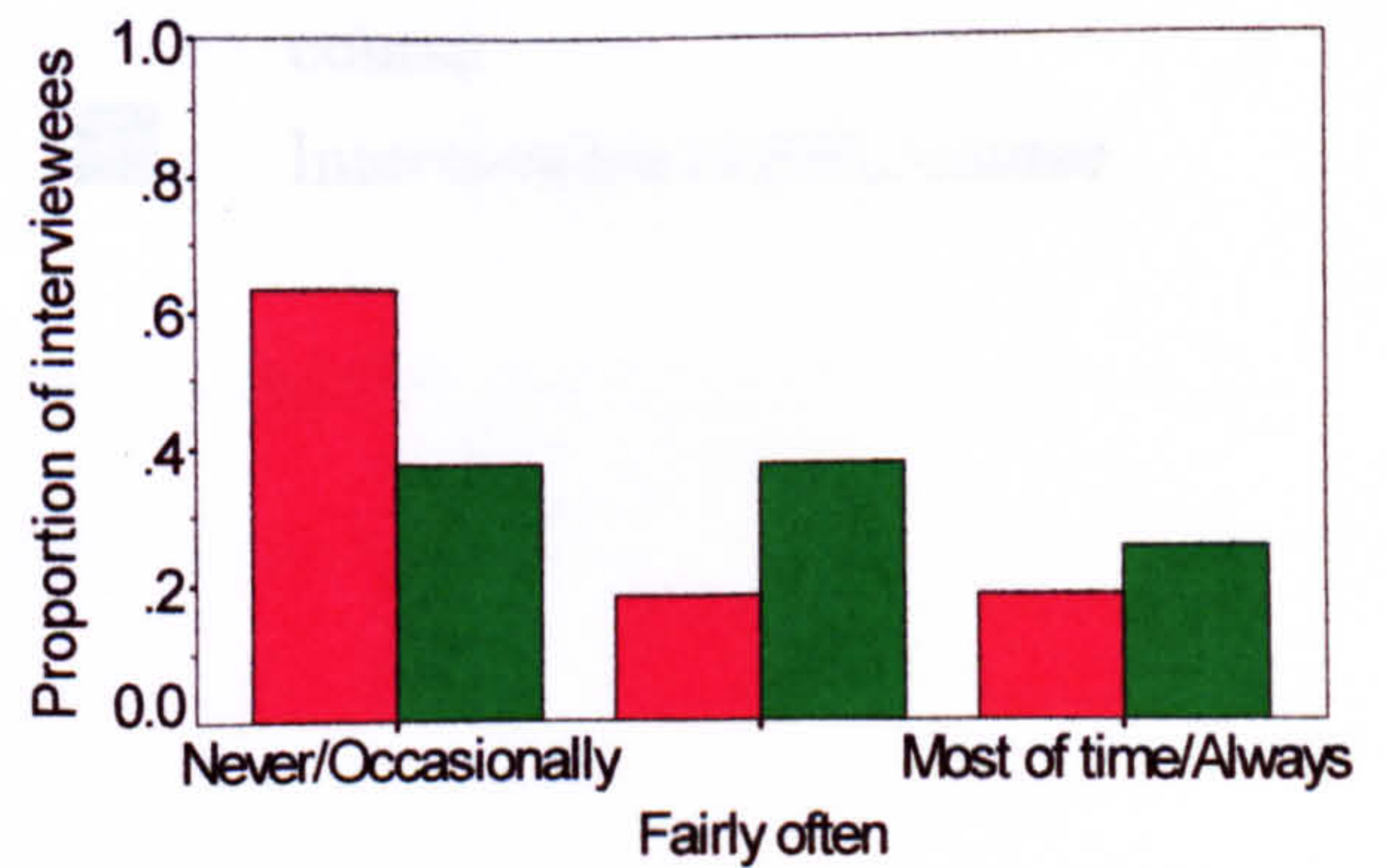


Fig. 65 'I organise...around central ideas or themes.'

■ Interviewees in traditional course
■ Interviewees in PBL course

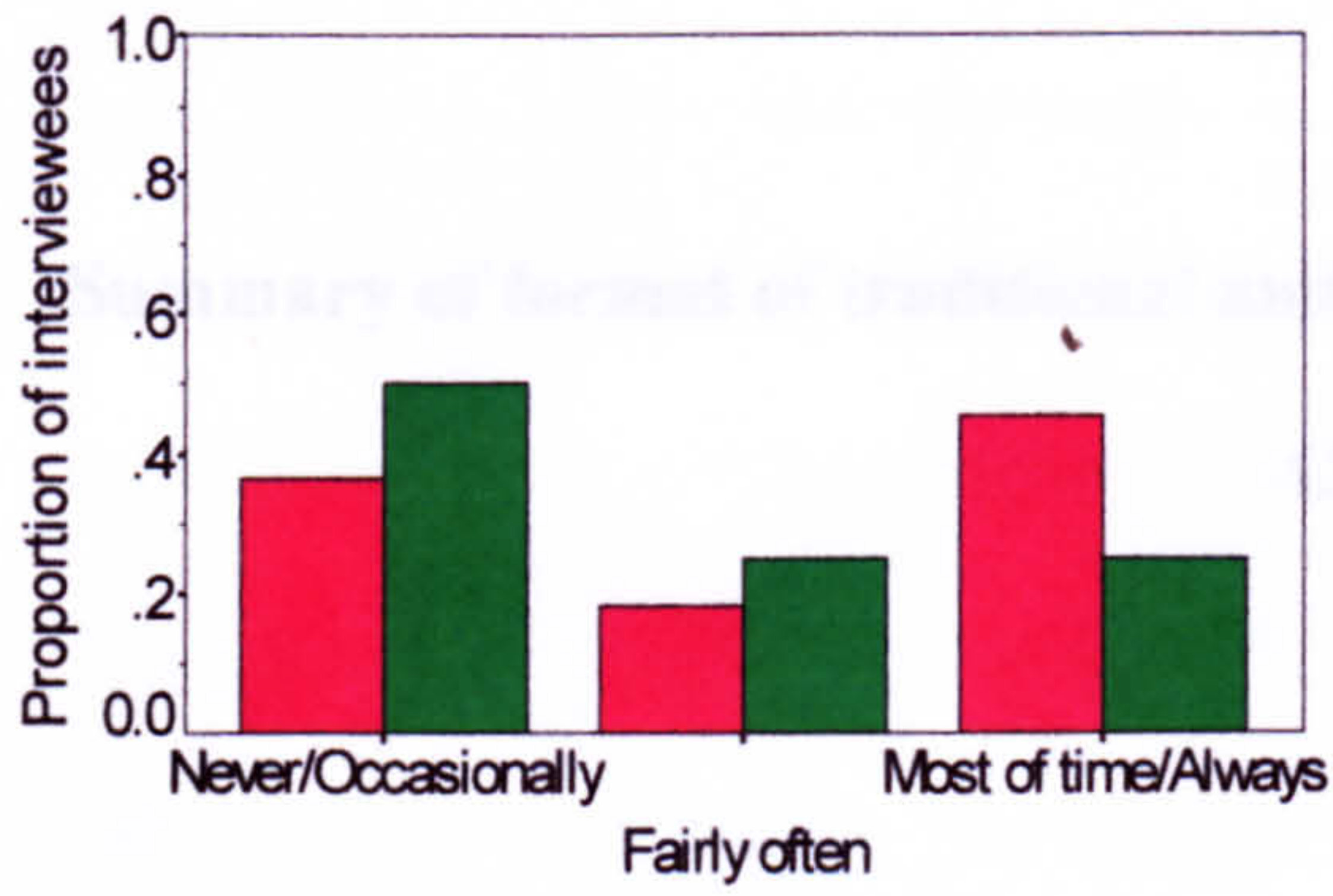


Fig.66 'I..work out which questions will come up...'

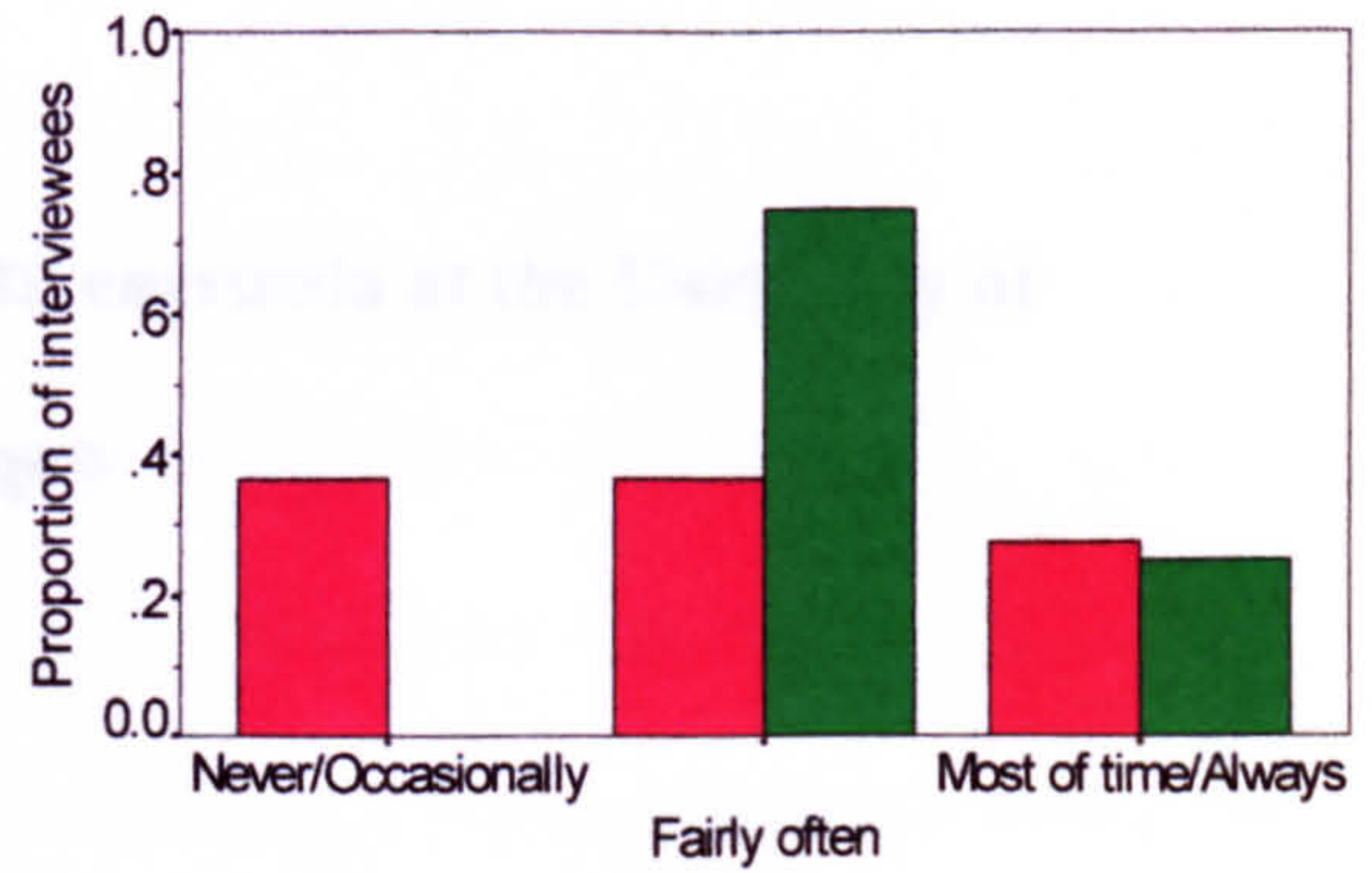


Fig. 67 'I discuss...material with other students.'

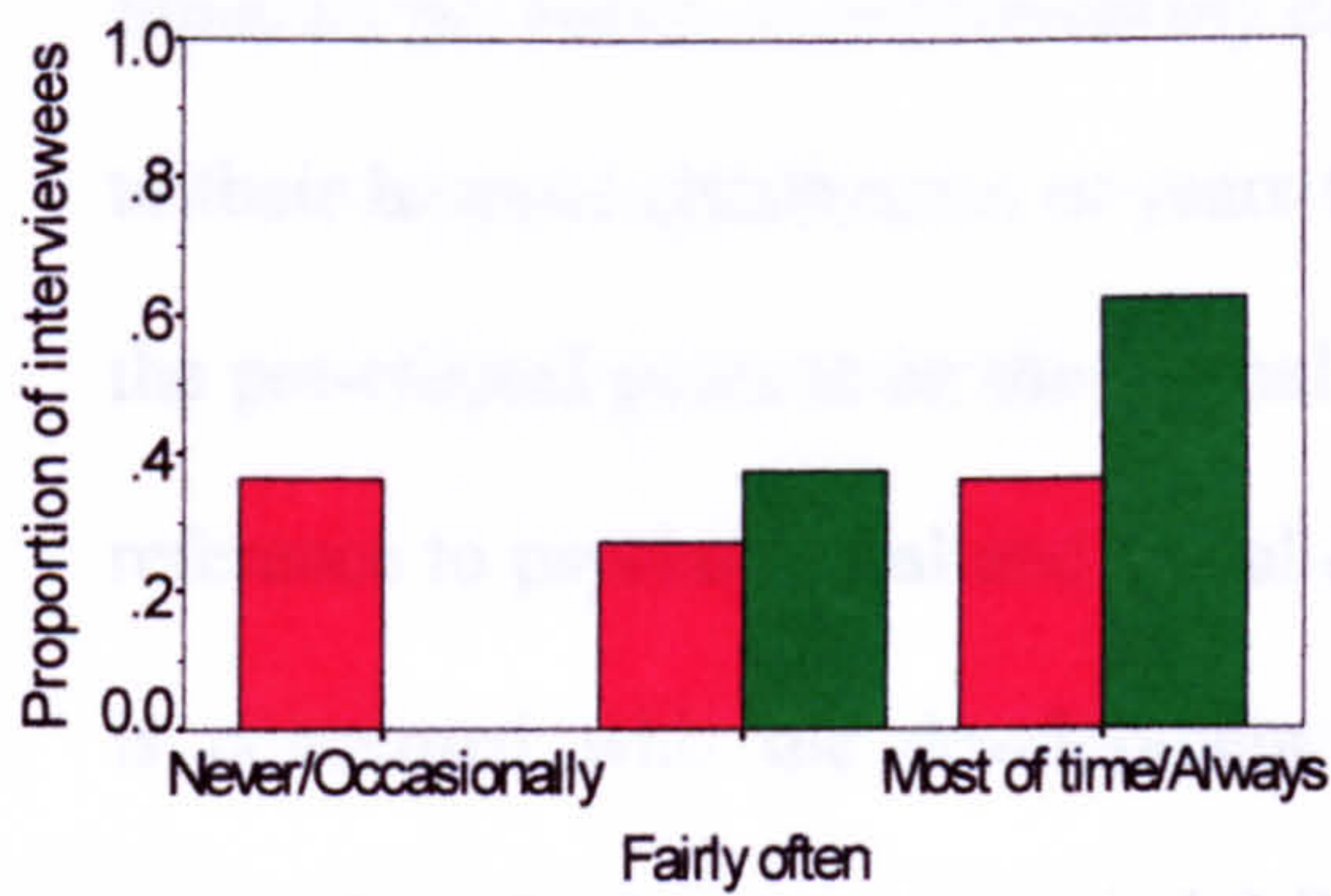


Fig. 68 "When.. "stuck",...discuss..with another student

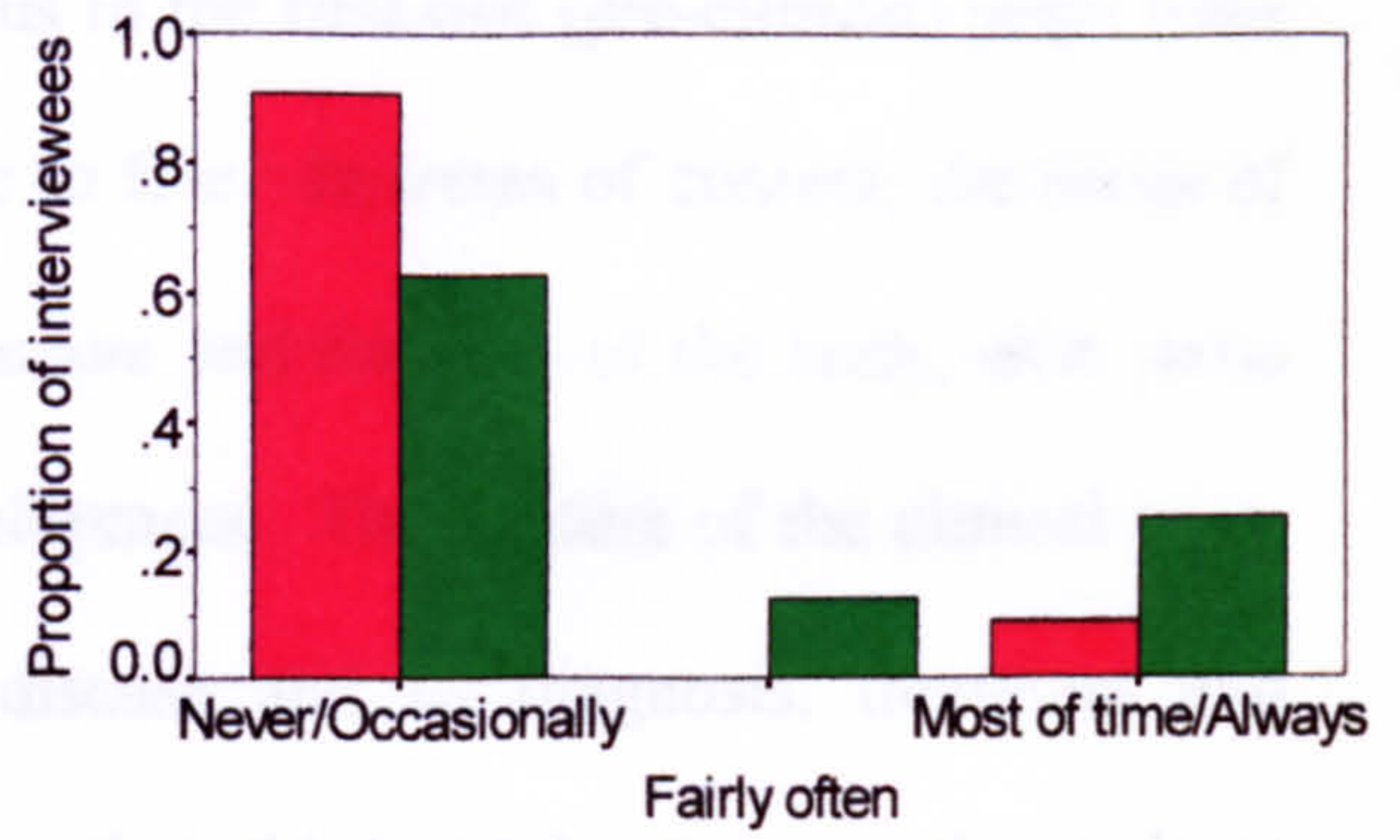


Fig. 69 "When.. "stuck", I raise..problem with...staff.'

- Interviewees in traditional course
- Interviewees in PBL course

Year 1: Anatomy, including immunology/Pathology

Molecules and Medicine

Biochemistry

Physiology

Appendix 7

Summary of format of traditional and PBL curricula at the University of Glasgow

i) Traditional curriculum

Students are based on the university campus in the first two (pre-clinical) years prior to their hospital attachments in years three to five. In terms of content, the focus of the pre-clinical years is on the normal structure and function of the body, with some reference to psychological and social development. The content of the clinical years is concerned with the development of disease and its diagnosis, treatment and prevention. In the summer period following their third and fourth years, the students spend at least four weeks studying a medical subject of their own choice, subject to approval of the Dean of the Medical Faculty. The subjects studied by students in the first two years of the 1995-96 curriculum were as follows:

Year 1: Anatomy, including Immunology/Parasitology
 Molecules and Medicine
 Biochemistry
 Physiology

Year 2: Anatomy, including Biology and Genetics
 Biochemistry
 Pharmacology
 Environment, Behaviour and Health

Delivery of course content was through a concentrated, daily programme of scheduled lectures and laboratory sessions (dissection and experimental) from 9 a.m. to 5 p.m. Assessment was based on laboratory reports and on class exams, usually in a multiple choice format, at the end of the first and second terms. Most of the professional, final exams were scheduled for June but, in both first and second years, one professional exam was held at the end of the second term, in March.

In addition to offering the necessary academic qualifications, applicants for admission to the course were required to attend an interview and were also expected to provide evidence of their motivation to study medicine and an understanding of the level of commitment required in the profession.

In sum, the aim of the two pre-clinical years in medicine were to provide students with a strong foundation in the basic science subjects relevant to medicine, prior to the beginning of the clinical part of the curriculum in third year.

ii) Problem-based curriculum

The new undergraduate course is a student-centred one, in which most of the learning takes place in small groups and the emphasis is on the student being, or becoming, an active, self-directed participant, in preparation for professional lifelong learning. As a result of the changes which have been introduced in the organisation of course content and in teaching and learning methods, it is hoped to remove the traditional pre-clinical/clinical division and to encourage students to integrate knowledge and skills across a range of subjects with the ultimate aim of being able to apply these in the clinical setting. The course reflects the following twelve themes:

- Clinical practice
- Communication skills
- Human biology
- Behavioural science
- Human disease
- Public health
- Handicap, disability and rehabilitation
- Finding out, research and experiment
- Ethics and law
- Gender and ethnic background
- Therapeutics and management
- Palliative medicine and the care of the dying

The curriculum consists of four major components: *i)* the integrated core *ii)* special study modules *iii)* vocational studies and *iv)* the clinical core. The core, focusing on the integration of clinical and scientific work, incorporates material intended to provide students with a broad overview of medical and scientific principles through a series of problem-based learning sessions. The academic year is organised as a series of five-week blocks, which include in first year, for example, blocks on public health, anatomy, and homeostatic regulation, amongst others. Students will usually have two PBL sessions per week (attendance at which is compulsory), in which scenarios are used as the 'prompt' for learning, with the students drawing on a seven-step process. The process includes identifying in the scenario those terms which are unknown to them, defining the main problems/issues, brainstorming to activate the prior knowledge of group members in relation to the problems and then to draw up learning objectives to address the areas of 'ignorance' that have emerged. The next stages involve the students in coming back to the group to share what they have learned in the interim, participating in discussion about the material, and, finally, reviewing the learning and group processes.

The work associated with the PBL sessions is supported by a range of learning resources, which can include demonstrations, lab sessions, seminars, visits, lectures and tutorials. The student's performance in assessed coursework in the blocks in first year contributes 20% of the degree examination. In addition, and in deliberate contrast with the heavy reliance in the traditional curriculum on frequent class exams and lab reports, assessment in the new course also includes an assessment of independent learning (Medical Independent Learning Exercise, MILE), an objective, structured clinical examination (OSCE), and a written examination.

The special study modules, which account for about 20% of the student's structured time, allow students to select subjects that are of special interest to them, for instance, a foreign language, and to study them in depth. In the third component, vocational studies, students are introduced to patients and the care of patients in hospital and community settings. The aim is to introduce students in a structured way to essential clinical procedures and techniques and to encourage the development of communication skills in a range of clinical contexts.

Finally, in the clinical core, students work in small groups with clinical staff and patients in hospitals and community settings. It builds on the integrated core and vocational studies and takes up most of the final two years of the course.

