Science and Mathematics Education Centre

Differences in Student Perceptions of Teacher-Student Interpersonal Behaviour in Regional Streamed Secondary Mathematics and Science Classes

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Declaration

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

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

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ABSTRACT

The purpose of this study was to examine teacher and students' perceptions of teacher-student interpersonal behaviour in regional secondary classrooms. Teachers were then presented with this information so that a comparison between teacher ideal, teacher actual and student perceptions of their classroom could be examined. The results were then able to be used by teachers to reflect on and seek to improve their teaching practice.

This study utilised the *Questionnaire on Teacher Interaction* (QTI) to collect data about the classroom learning environment of Australian regional mathematics and science classrooms. Qualitative information in the form of classroom observations and informal interviews has also been collected from a small subset of the student sample. This qualitative information was collected by the researcher in the dual roles of teacher and researcher. Triangulation of the methods of data collection sought to better validate the data collected, and assess multiple perspectives in the classroom.

The study has involved a large sample of students from one country high school in Western Australia. All the mathematics classes from Years 8, 9 and 10 and all science classes from Years 8 and 10 have been included in this study. A particular focus for this study was the inclusion of both streamed and non-streamed classes from the mathematics and science areas.

The value of this research has been enhanced in that the results have been used as a teaching feedback tool for participants involved in the study to examine, reflect and improve on their teaching practice. The research is a real world, authentic example of one instance where results from the study were used immediately on a local scale by participants. A unique feature of the outcomes from this project is that the teacher appears to play a greater role in determining the classroom climate than does the homogeneous or heterogenous grouping of students within a subject.

ACKNOWLEDGEMENTS

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CHAPTER 1

INTRODUCTION

1.1 Background to the Study

As a full time teacher, my opinion has been that the atmosphere or classroom learning environment in a classroom plays an important role on the outcomes achieved by the students. I have always relied on my 'feelings' to judge the classroom climate. Why am I eager to teach some classes but 'feel' reluctant to go off to other classes? In my role as a support teacher, what is it that makes my position in some classes helpful and enjoyable, but in others uncomfortable and unable to effectively improve student learning?

Research has consistently shown that attention to classroom learning environment is likely to pay off in terms of improving student outcomes (Fraser, 2001; Wubbels, 1993). The way in which a teacher interacts with students is important because it is a predictor of student learning and discipline problems and of teacher job satisfaction and burnout (Fraser, 1998). The question I then asked myself was, 'How can teachers achieve a positive learning environment in all their classes?' I then searched for ways of determining the differences in the learning environment that were occurring within my classrooms.

Spending time on self-evaluation of the teaching and learning experiences occurring in their classrooms, enables reflective teachers to improve their teaching practice. After an initial pilot trial for this study, the teachers within the Mathematics and Science Departments of the sample school were very eager to gain more information about their classroom environments. They were keen to reflect on their teaching practice and sought to make effective changes in their classrooms to enhance student perceptions of the learning environment and the nature of the relationships that students have with their teachers. Much research on the nature and quality of interpersonal relationships between teachers and students has been conducted in The Netherlands, Australia, Singapore, Taiwan and Brunei (Aldridge, Fraser, & Huang, 1999; Goh & Fraser, 1998; Khine & Fisher, 2001; Rickards & Fraser, 1996; Wubbels & Levy, 1993).

The study *Teachers Enhancing Numeracy* (2005), conducted by Education Queensland, Queensland Catholic Education Commission and the Association of Independent Schools of Queensland found that mathematics teachers need to be competent in six core areas. These core areas are teacher mathematics knowledge, pedagogic knowledge, planning, active learning and effective classroom enquiry and teacher-student classroom engagement, and that they should continually reflect on and share experiences. The study "Teachers Enhancing Numeracy" concluded that future research needed to be conducted to explore teacher-student learning interactions, particularly the interaction effects of resistance, and investigate teacher characteristics that impact on student learning.

No longer is it adequate for teachers to rely mainly on the assessment of academic achievement to give the complete picture of the educational process (Fraser, 2001). Teachers should not feel that it is a waste of valuable teaching time to put energy into improving their classroom climates because research convincingly shows that attention to classroom environment is likely to pay off in terms of improving student outcomes (Fraser, 2001).

Many teachers often analyse the effectiveness of each lesson that they teach. Although this is good practice to be followed by teachers, often a teacher's interpretation can differ from their students' perceptions. Often teachers engaging in self-analysis concentrate on the lesson material and do not reflect on their interpersonal skills. A pilot study was conducted to gauge the suitability of a particular learning environment instrument to this school setting. The instrument selected was the *Questionnaire on Teacher Interaction* (QTI), which was designed to assess the interpersonal behaviour of teachers and interactions with their students in the classroom.

As has been demonstrated by other studies using the QTI (Fisher, Rickards, & Fraser, 1996), collecting data through informal interviews and classroom observations, as well as by surveys, was used to provide additional feedback for the teachers and students.

1.2 Aims and Objectives

Past research has looked at the relationship between student achievement and the degree to which classroom learning environment is positively perceived by teachers and students (Fraser, 2001). The overall aim of this study was to examine differences in student perceptions of teacher-student interpersonal behaviour in classrooms and enable teachers to use this collected information to make possible improvements to their classroom environments. To achieve this aim, the following objectives were derived.

The objectives of this study are to determine if:

1. the *Questionnaire on Teacher Interaction* (QTI) is a valid and reliable instrument for this unique sample;

2. the teacher's actual perception of their classroom environment differs from the student perceptions of secondary upper, middle and lower stream mathematics and science classes;

3. information collected from students about their perceptions of classroom environment in upper, middle and lower mathematics and science classes can be used by teachers to reflect on and make changes to their teaching practice; and

4. information collected from teacher actual and teacher ideal perceptions of teacher-student interpersonal behaviour can be used by teachers to reflect on and change their teaching practice.

1.3 Context of the Study

The learning environment in which I am situated is a country high school in the state of Western Australia, with a school population of approximately 710 students, enrolled in Year 8 through to Year 12. This school is classified as a Band 2 school, as it draws many of its students from a low socio-economic area. The data were collected during Semester Two of 2006. At this stage in the school year, the students had formed very definite opinions about their classroom environments and were very keen to participate in the study.

The sample for this study involved students from the Year 8, Year 9 and Year 10 mathematics and science classes. All Year 9 and 10 mathematics classes and one Year 10 science class are streamed. All mathematics classes and a sample of science classes will be used in the study. Approximately 500 student QTI responses were collected. There were 12 teachers involved in the study and 25 classes. A subset of this sample was used to assess if the classroom environment varies with streaming or subject.

The QTI was given to all students and teachers involved in the research project. This study aimed to have all students in a class participate. All classes involved in the study contained more than ten students. It is interesting to note that only one student in the entire sample chose not to participate in the study. The QTI was administered by the researcher to most classes. Where the researcher did not administer the QTI, the classroom teacher administered the test and the surveys were immediately returned to the researcher by a class member. The students in these classes had already completed the QTI in their mathematics classes so were already familiar with the survey structure.

1.4   Significance of the Study

The research has been of value to the participating teachers, as they have obtained feedback during the study which has enabled them to reflect on and make possible changes to enhance the learning environment of their classrooms. The students felt valued because their perceptions of the classroom environment were important in obtaining data.

In the sample school, some streaming occurs in both mathematics and science classes. A school priority is to improve the performance of low literacy and low numeracy students. The mathematical abilities required of students in Western Australia is well below national standards, with the state slipping even further behind in the past two years (The Weekend Australian, 2006). An unresolved question is, "Does streaming benefit our high achieving students?" This research has implications for education, as mathematics is becoming increasingly important in modern workplaces, so we need to enhance the mathematical capabilities of our students in as many ways as we can (ICE-EM Mathematics, 2006).

From this research, it appears that the teacher has a greater effect on determining the classroom climate than homogeneous or heterogeneous grouping of students. The Western Australian Government has been under pressure to adopt merit-based pay for teachers (The West Australian, 2007). The best teachers appear to be good at their job because of their ability to relate to students (The West Australian, 2007). A teacher who relates well to students would be assumed to have a positive classroom environment. The use of the QTI provides information for teachers to improve the nature of the relationships that they have with their students, thus enabling them to continue their personal and professional development.

1.5   Overview of Methodology

The sample for this study involved students from the Year 8, Year 9 and Year 10 mathematics and science classes. The teachers of all mathematics classes and most Year 8 and Year 10 science classes chose to participate in this study.

The qualitative data were collected from a subset of this sample, in five classes. One of these classes was a low ability Year 9 class in which the researcher works as a Numeracy Support teacher. The information collected from interviews and classroom observations is an essential part of supporting the validity of the questionnaires. A unique feature of the qualitative data collection was that the researcher had the dual role of participant- observer.

1.6   Overview of the Thesis

The first chapter of this thesis has introduced the research project. It gives the background and objectives of the project, states the research questions, describes the context in which the study has occurred, and describes the study's significance and methodology used. A literature review is provided in Chapter 2 on the history of learning environment research, learning environment instruments, the selection of the instrument used, past learning environment studies and ability grouping in secondary schools.

Chapter 3 contains a description of, and reasoning for the research methodology chosen. This chapter reports on data sources, role of the participants and the method of data collection. Chapter 4 presents the results of the data that was collected. Chapter 5 discusses the results with specific reference to the research questions and relates these results to findings from previous studies. Information from discussions with teachers and classes on the results from the study are included. Chapter 6 presents an overview of the study, including the implications for teaching and learning within the school, limitations of the study, and suggestions for possible future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Chapter 2 provides a review of the background to learning environment research and describes some of the available learning environment instruments. A detailed description of the chosen instrument used in this study and the reasons for the choice of instrument is then given. The next section gives examples to show the wide variety of learning environment research that has been conducted using this learning environment instrument. This chapter also reviews literature on ability grouping in schools and its effect on student attitude and student achievement outcomes.

2.2 History of learning environments research

Early studies (Ryans, 1960 as cited in Wubbels & Levy, 1993) examined personality traits in their search for 'the effective teacher'. Teacher attitudes and style were then though to be better predictors for 'the effective teacher'. The teacher's interpersonal behaviour or communication style became the focus of learning environments research.

Over 30 years ago, Herbert Walberg and Rudolf Moos began independent programs of research which formed the foundation for educational learning environment research (Fraser, 1998a). Moos proposed three types of dimensions for examining learning environments and these are relationship dimensions (assess the extent to which people are involved with and supportive of one another), personal growth dimensions (task orientation in classrooms which reflect the underlying goals toward which a setting is oriented) and system maintenance and change dimensions (degree of structure, clarity, and openness to change that characterize a setting) (Moos, 1991). Moos initially developed social climate scales for use in various environments, which included psychiatric hospitals and correctional institutions. From this research, the *Classroom Environment Scale* (CES) was developed. Rather than relying on the ratings of outside observers, Trickett and Moos defined the

classroom environment in terms of the shared perceptions of the people in that environment (Moos, 1979). Interpersonal and interactional behaviour between teachers and their students is an example of a relationship dimension as proposed in the theoretical framework for human environments by Rudolf Moos in 1974.

During the late 1960s, Walberg developed the widely-used *Learning Environment Inventory* (LEI) as part of the research and evaluation activities of Harvard Project Physics (Walberg & Anderson, 1968). A phenomenological approach provides important data that the objective observer who counts cues or behaviours may miss (Walberg, 1976 as cited in Moos, 1979). The final version of the LEI contained a total of 105 statements (or seven per scale) descriptive of typical school classes. The scoring direction (or polarity) is reversed for some items (Fraser, 1998a). Walberg (1976 as cited in Moos, 1979) also noted that certain kinds of social environments, as indexed by student and teacher perceptions, may be worthy goals in their own right, quite independently of how they relate to student achievement or other criteria.

The history of the first two decades of learning environment research in Western countries shows a strong emphasis on the use of a variety of validated and robust questionnaires that assess students' perceptions of their classroom learning environment (Fraser, 1998a). In the 90s, Asian researchers also contributed to learning environments research as some of the main questionnaires developed in the West were adapted and cross-validated for use in several Asian countries (Adolphe, Fraser, & Aldridge, 2003; Goh & Fraser, 1998; Riah & Fraser, 1997).

2.3   Learning environment instruments

Following on from Moos' and Walberg's initial work, instruments have been adapted and new instruments have been developed for specific learning environments.

The *My Class Inventory* (MCI) is a simplified version of the LEI and was developed originally for use among upper primary aged students (Fisher & Fraser, 1981). It was simplified in order to reduce reading difficulties that were experience by some students. Some other variations on the original included five scales on the MCI rather than the original 15 scales, the four-point response was reduced to a two point

scale (Yes-No) response format and the student answered the questions directly onto the question sheet so that mistakes in transferring answers was avoided (Fraser, 1998a). In a study among primary mathematics students in Singapore, Goh and Fraser (1998) further modified the MCI by altering the two point response (Yes-No) to a three point response (Seldom, Sometimes, Most of the Time).

The *Individualised Classroom Environment Questionnaire* (ICEQ) was developed so that individualised classrooms could be distinguished from traditional classrooms. This instrument has five scales and each scale contains ten items. Polarity is reversed for some items. Each item has a choice of five responses. These are Almost Never, Seldom, Sometimes, Often and Very Often. The final published version of the ICEQ (Fraser, 1990) gives permission to purchasers to make unlimited copies of the questionnaires and response sheets.

The *College and University Classroom Environment Inventory* (CUCEI) was developed for use in higher educational settings where the maximum class size is less than 30 students (Fraser & Treagust, 1986). These smaller groups are 'seminars' or 'tutorials'. The final form of the CUCEI has seven seven-item scales, with each item having a choice of four responses (Strongly Agree, Agree, Disagree, Strongly Disagree) and the scoring direction is reversed for some items. An example of one item is: 'Teaching approaches allow students to proceed at their own pace' (Individualisation).

 The *Science Laboratory Environment Inventory* (SLEI) was developed to assess the unique and important laboratory learning environments at high school or higher education levels (Fraser, Giddings, & McRobbie, 1992). The SLEI has five scales (each with seven items) and the five response alternatives are Almost Never, Seldom, Sometimes, Often and Very Often. An Open-Endedness scale was included in this instrument. An example of one item is: 'Members of this laboratory class help me' (Student Cohesiveness). The SLEI was field tested and validated simultaneously with a sample of over 5,447 students in 269 classes in six different countries (USA, Canada, England, Israel, Australia, and Nigeria) (Fraser, 1998a).

The *What is Happening In This Class* (WIHIC) questionnaire assesses a student's perceptions of the class as a whole and a student's personal perceptions of his or her role in the classroom. The WIHIC questionnaire was developed by Fraser, McRobbie and Fisher (1996) to bring parsimony to the field of learning environments by combining the most salient scales from existing questionnaires with new dimensions of contemporary relevance to science education (Adolphe, Fraser, & Aldridge, 2003). The final form of the WIHIC contained seven eight-item scales. The WIHIC has been used in its original form or modified form in studies involving 250 adult learners in Singapore (Khoo & Fraser, 1997), 2,310 high school students in Singapore (Chionh & Fraser, 1998) and 1,161 students in Year 9/10 classes in Australia and Indonesia (Adolphe, Fraser, & Aldridge, 2003).

A summary of the nine main classroom environment instruments Fraser (1998b) is shown in Table 2.1. This table shows the name of each scale in the nine instruments, the level (primary, secondary, higher education) for which each instrument is suited, the number of items contained in each scale, and the classification of each scale according to Moos'(1974) scheme for classifying human relationships.

A unique feature of the instruments listed in Table 2.1 is that many are designed in two forms, Actual and Preferred. The Actual Form records the perceptions of the participants as they see themselves in the learning environment. The Preferred Form asks the participant to consider their ideal or preferred learning environment. Fraser (1981) has proposed a simple approach by which teachers can use information obtained from classroom environment questionnaires to guide attempts to improve their classrooms. The assessments of student perceptions of both their actual and preferred classroom environment are used to identify differences between the actual classroom environment and that preferred by the students. Strategies aimed at reducing these differences are then implemented (Fraser, 1989). In an Australian study, science teachers have used the QTI to assess their actual, ideal and their students' perceptions of the classroom environment in order to reflect on and make possible changes to improve their teaching practice (Fisher, Rickards, & Fraser, 1996).

Table 2.1

Overview of Scales Contained in Nine Classroom Environment Instruments (LEI,
CES, ICEQ, MCI, CUCEI, QTI, SLEI, CLES and WIHIC)

			Scales classified according to Moos's scheme		
Instrument	**Level**	**Items per scale**	**Relationship Dimensions**	**Personal Development dimensions**	**System Dimensions**
Learning Environment Inventory (LEI)	Secondary	7	Cohesiveness Friction Favouritism Cliqueness Satisfaction Apathy	Speed Difficulty Competitiveness	Diversity Formality Material Goal direction Disorganisation Democracy
Classroom Environment Scale (CES)	Secondary	10	Involvement Affiliation Teacher support	Task orientation Competition	Order and organisation Rule clarity Teacher control Innovation
Individualised Classroom Environment Questionnaire (ICEQ)	Secondary	10	Personalisation Participation	Independence Investigation	Differentiation
My Class Inventory (MCI)	Elementary	6-9	Cohesiveness Friction Satisfaction	Difficulty Competitiveness	
College and University Classroom Environment Inventory (CUCEI)	Higher Education	7	Personalisation Involvement Student cohesiveness Satisfaction	Task orientation	Innovation Individualisation
Questionnaire on Teacher Interaction (QTI)	Secondary/ Primary	8-10	Helpful/Friendly Understanding Dissatisfied Admonishing		Leadership Student responsibility and freedom Uncertain Strict
Science Laboratory Environment Inventory (SLEI)	Upper Secondary/ Higher education	7	Student cohesiveness	Open-endedness Integration	Rule clarity Material environment
Constructivist Learning Environment Survey (CLES)	Secondary	7	Personal relevance Uncertainty	Critical voice Shared control	Student negotiation
What is Happening in This Classroom (WIHIC)	Secondary	8	Student cohesiveness Teacher support Involvement	Investigation Task orientation Cooperation	

(as cited Fraser, 1998b)

2.4   Past learning environment studies

Learning environment research originated in Western countries but during the last two decades has occurred widely in Asian countries and other parts of the world, where significant contributions have been made.   Examples of early learning environment research conducted in Asia, through to more recent studies in Asia and Australia have been included to show some of the significant contributions that have occurred in the last two decades.

In the highly competitive achievement-orientated educational system in Singapore, research into science education was considered to be vital and valuable information. Wong and Fraser (1994) used the *Chemistry Laboratory Environment Inventory* (CLEI), which is a modified form of the *Science Laboratory Environment Inventory* (SLEI) with a sample of final year secondary school chemistry students. This study was the beginning of research into science laboratory environments in Singapore and examined the environment–attitudinal outcomes linkage.   The five environment scales used in this study were Student Cohesiveness, Open-Endedness, Integration, Rule Clarity and Material Environment.   The three attitudinal scales used were: Attitude to Scientific Inquiry, Adoption of Scientific Attitudes, and Enjoyment of Science Lessons. Two of the five environment scales, namely, Integration and Rule Clarity, were found to have a strong, consistent and positive relationship with all three attitudinal scales (Wong & Fraser, 1994).

A cross-national study was conducted among junior secondary science students in Australia and Indonesia by Adolphe, Fraser and Aldridge (2003). This study used an English and Indonesian version of *What is Happening In This Class?* (WIHIC), where it was found that for some scales (Involvement and Investigation), Indonesian students perceive their learning environment significantly more positively than do Australian students. Another study in Indonesia and using a university- level version of the WIHIC questionnaire was conducted by Margianti, Fraser and Aldridge (2003).   The results suggested that teachers wishing to improve the learning environment at the university level should consider providing more student cohesiveness, teacher support, involvement, order and organisation, task orientation

and equity. Examples of theses written about Asian studies showed a tendency to rely mainly on the use of questionnaires for data collection.

The use of questionnaires in Asian learning environment research has been prolific but studies which include qualitative methods such as interview and observation have been less common (Fraser, 2002). Fraser and Tobin (1991) realized the potential advantage of combining qualitative and quantitative methods within the same learning environment study. They conducted a study that used the *Classroom Environment Scale* (CES) and this information was combined with observations in science classrooms. Fraser and Tobin (1991) found that through triangulation of the quantitative and qualitative data, greater credibility could be placed on findings because they emerged consistently from both sets of data.

A study conducted in South Africa by Sebela, Fraser, and Aldridge (2003) modified and validated the *Constructivist Learning Environment Survey* (CLES) for use at the intermediate and senior levels of schooling in South Africa. This survey investigated whether teachers were able to make use of student responses to the CLES to develop and implement action research strategies for improving the learning environment. One teacher involved in the study commented that the use of a journal as a reflective writing tool was useful but time consuming. The teacher required constant support and encouragement for the journal-writing to continue during the study.

With the change in emphasis from teacher-based to outcomes-based education and the greater use of technology occurring in many countries, a study was conducted by Aldridge, Fraser, and Fisher (2003) to investigate student outcomes. A new questionnaire (*Technology-Rich Outcomes-Focused Learning Environment Inventory*, TROFLEI) was developed and validated for assessing students' perceptions of their actual and preferred classroom learning environments which was appropriate for outcomes-focused, technology-rich conditions.

It is noteworthy that in both Western and Asian research, the most common studies are investigations involving associations between students' outcomes and their classroom environment perceptions. Studies which include the use of qualitative methods in data collection have been less commonly used in Asian studies. There is

scope to adapt currently widely-used paper-and–pencil questionnaires to online formats (Fraser, 2002). As shown in the above studies, growth is continuing to occur in the area of learning environments on a world wide scale.

2.5 Selection of instrument

One particular aspect of the classroom learning environment is the interpersonal behaviour of the teacher with the students. Interpersonal teacher behaviour in classrooms was investigated from a systems perspective using the theory of Waltzlawick, Beavin, and Jackson (1967) on communication processes. Within the systems perspective on communication, it is assumed that behaviours of participates influence each other mutually, i.e. interpersonal systems may be viewed as feedback loops, since the behaviour of each person affects and is affected by the behaviour of each other person (Watzlawick, Beavin, & Jackson, 1967). It is assumed that a circular communication process occurs in the classroom, where the behaviour of the teacher is influenced by the behaviour of the students and in turn influences student behaviour (Rickards & Fisher, 1996).

With the systems perspective in mind, Wubbels, Creton, and Hooymayers (1985) developed a model used to describe teacher communication styles based on earlier research by Leary (1957). Leary stated that people communicated according to two dimensions-a Dominance-Submission dimension (e.g., who is controlling the communication) and a Cooperation-Opposition dimension (how much cooperation there is between the people who are communicating) (Levy, Wubbels, Brekelmans, & Morganfield, 1994). One of the keys to the Leary model is that communication behaviours continually change, so the communication styles of teachers begin to emerge only when many behaviours have occurred (Wubbels & Levy, 1993).

Wubbels, Creton, and Hooymayers (1985) extended the Leary model to one with eight sections (see Figure 2.1). The sections in the model are labelled DC, CD, CS, SC, SO, OS, OD and DO according to their position in the coordinate system (Wubbels, 1993). The two sectors DO and OD are both characterised by Dominance and Opposition. However, in the DO sector, the dominance behaviour prevails over

the opposition aspect but in the adjacent OD sector, the behaviour has more opposition and less dominant character.

Using this theoretical model of proximity (cooperation-opposition) and influence (dominance-submission), Wubbels and the other Dutch researchers developed the *Questionnaire on Teacher Interaction* (QTI) in order to assess student and teacher perceptions of eight behaviour aspects. These are *Leadership* behaviour, *Helpful/Friendly* behaviour, *Understanding* behaviour, *Student Responsibility and Freedom* behaviour, *Uncertain* behaviour, *Dissatisfied* behaviour, *Admonishing* behaviour and *Strict* behaviour (Wubbels & Levy, 1993). Figure 2.1 shows the model on which the QTI is based, with the typical behaviours for each sector. The closer the instances of behaviour are in the chart, the more closely they resemble each other (Wubbels, 1993).

The *Questionnaire on Teacher Interaction* (QTI) focuses on the nature and quality of interpersonal relationships between teachers and students and was first used in research at the senior high school level in The Netherlands. In the late 1980s an American version based on the Dutch version was developed by Wubbels and Levy (1989) and consisted of 64 items (Wubbels, Brekelmans, & Hooymayers, 1991). A short economical 48-item version was developed by Wubbels (1993) in Australia and has been used extensively to examine the interpersonal behaviour in the classroom setting.

The QTI is worded in such a way as to elicit an individual student's perceptions of the class as a whole. This questionnaire is appropriate for this project that examines the 'consensual' beta press: the shared view that members of a group hold of the environment (Stein & Bloom, 1956). Each item has a five-point Likert response scale ranging from Never (0) to Always (4). The reason that this scale was chosen was that the majority of previous studies used a five point scale of either 1-5 or 0-4.
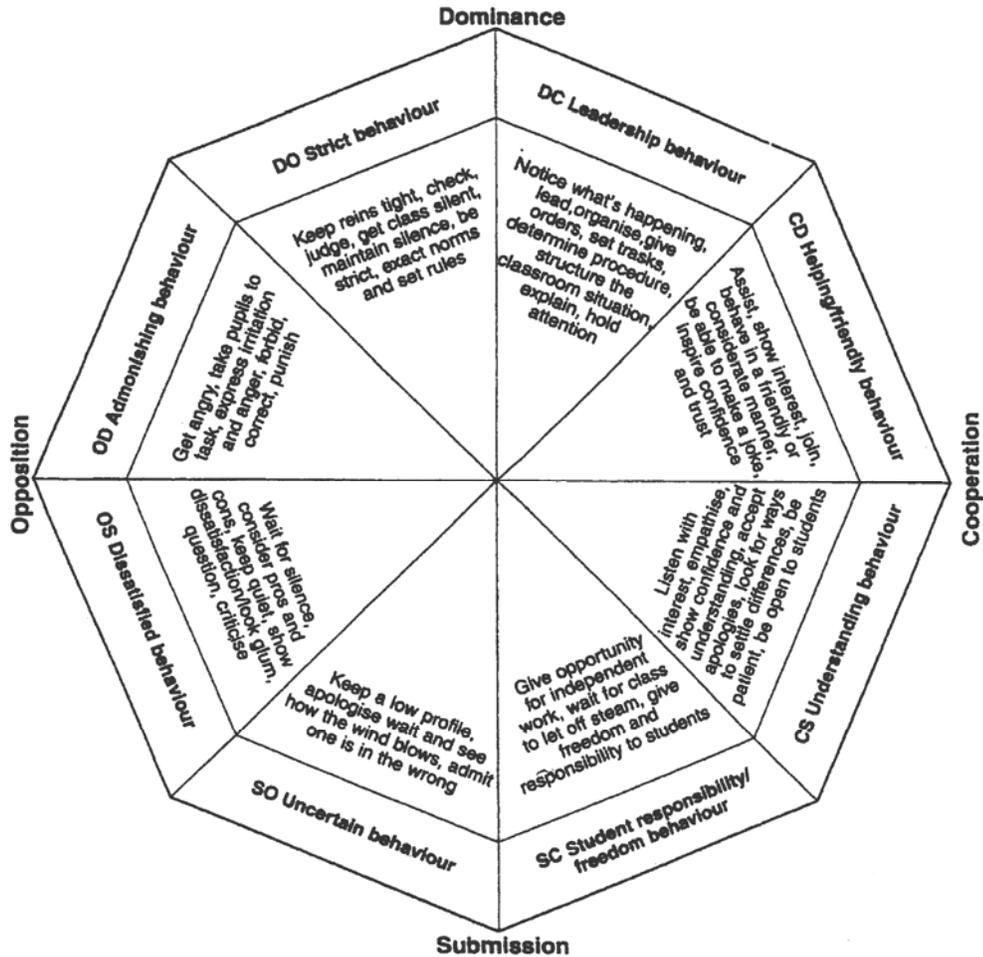
Figure 2.1. The model for interpersonal teacher behaviour.

There is a version of the QTI that teachers can complete to measure their perceptions of their 'actual' interpersonal behaviour and then another form which measures their perceptions of their 'ideal' teacher. There is a change in the wording of the questions to suit the different instruments, for example, 'I talk about' becomes 'This teacher would talk about'. The students wording would be 'This teacher talks about'. Appendix A, Appendix B and Appendix C contain the Student Form, Teacher Actual Form and Teacher Ideal Form of the QTI. The 48-item version was chosen because it takes less time to administer and score and causes less disruption to the busy classroom environment. These short forms have adequate reliability when used to

average the perceptions of students in a classroom situation. The choice of questionnaire was also guided by the age of the students involved in the project.

The choice of the Questionnaire on Teacher Interaction (QTI) allows for the teachers taking part in the project to have a basis for reflecting on their own teaching and thus providing a basis for guiding systematic attempts to improve their own teaching practice (Fisher, Rickards, & Fraser, 1996). Students spend a large amount of time in the classroom and are therefore in a strong position to make reliable and sound judgements. Instead of using outside observers, the use of student and teacher perceptions of the classroom environment defines the environment from the perspectives of the participants within the environment. In The Netherlands, research on the nature and quality of interpersonal relationships between teachers and students emerged from research that began in the 1970s, where the main goal was to investigate beginning teachers' experiences in order to improve their pre-service program (Wubbels & Levy, 1993).

The QTI has been used in many studies of lower secondary students and has been shown to be valid, reliable and appropriate for use with this sample group. Each item in a scale has been checked to see that it measures the same aspect of behaviour for any teacher, for example, all items on the Understanding scale refer to a common concept. These items are then described as 'homogenous' or having internal consistency (Wubbels & Levy, 1993). American, Australian and Dutch samples have been used where all scales have shown satisfactory reliability (Wubbels & Levy, 1993). In one large secondary study in Australia, the QTI was given to 3,994 high school science and mathematics students (Fisher, Fraser, & Rickards, 1997) and validation data for the classroom environment scales were produced. Using the alpha coefficient, acceptable internal consistency reliabilities for the QTI scales ranging from 0.63 to 0.88 were found for student responses in this secondary study.

Goh and Fraser (1998) examined interpersonal teacher behaviour and classroom climate among primary mathematics students in Singapore. Two learning environment instruments were used within the study (the QTI and MCI) and overall yielded consistent associations between classroom environment and student outcomes.

A study conducted by Koul and Fisher (2003) provided validation data for the use of the QTI in science classrooms in India. The results showed that students had a more positive attitude towards science classes when their teachers displayed leadership and helping/friendly behaviour. Uncertain, dissatisfied and admonishing behaviours were associated with negative attitudes towards their science classrooms. As a result of such studies, teacher-student interaction has become a potentially powerful determinant of student learning (Koul & Fisher, 2003).

Lang, Wong, and Fraser (2005), investigated associations between teacher-student interaction and students' attitudes towards chemistry among 497 tenth-grade students from three independent schools in Singapore. This study provided validation data for the QTI when used with gifted students in chemistry laboratory classroom learning environments in Singapore. Gifted girls were found to perceive their teacher-student interactions more positively than the gifted boys.

A study conducted in Kashmir, India by den Brok, Fisher, and Koul (2005), focused on the relationship between teacher-student interpersonal behaviour and students' attitudes toward science. Analysis indicated that the sample of teachers rated lower on proximity and higher on influence than teachers in some other (Western) countries. Cultural differences may have been responsible for these differences or the sample may not have been representative for the whole of Kashmir or India.

A study conducted by Koul and Fisher (2006), used the QTI to identify and describe exemplary primary science teachers. The exemplary teachers were identified as those whose students' perceptions were more than one standard deviation above the mean on the scales of Leadership, Helping/Friendly, and Understanding and more than one standard deviation below the mean on the Uncertain, Dissatisfied and Admonishing scales. Observations and informal interviews were also conducted to validate the data. The teachers were then able to use these results to bring about desirable changes to their teaching.

Recent Asian studies have included Khine and Lourdusamy's research (2006), which addressed the issue of teacher's professional development through reflective

analysis of their own behaviour by getting feedback from students. The learning environment instrument used in this study was the QTI. The results showed that there were some significant differences in how the teachers see themselves and how students viewed them. This was one of the first Asian studies to make use of the practical benefits of learning environment assessments, where attempts could be made by the teachers to guide improvements in their classroom environments.

Fisher, den Brok, and Rickards (2006) conducted a multilevel analysis using the QTI on factors influencing students' perceptions of their teachers' interpersonal behaviour. Findings from this new line of research that has been conducted in Australia are significant for both researchers and teachers. The results indicate that perceptions of the teacher may vary as a result of class size, ethnic composition and gender composition (Fisher, den Brok, & Rickards, 2006).

Overall, the field of learning environments and the particular environment created by the teacher's interpersonal behaviour have continued to grow and move into the international scene. By 2006, over 40 countries had conducted studies using the QTI. New instruments are being developed and trialled and some of the earlier instruments are being modified as learning environment research enters into new areas.

Despite all these previous studies which have been examined and described, the particular type of study described in this thesis has never been done before. This study is building on the past but developing something new because of its unique situation. There appears to be little or no research which examines students' own perceptions of their classroom learning environment in relation to streamed or non-streamed classes. This study has contributed information to this new area of research.

Common class groupings have been taught by different teachers in the mathematics and science areas, and this has allowed comparisons to be made between the learning environments of a different teacher with the same group of students. The inclusion of mathematics and science students in the study, and the arrangement of class groups at the school have allowed for this comparison to occur.

The researcher was also a participant-observer in some of the classes involved in this study. The value added from this perspective was associated with the opportunity to get closer to the students involved in the study, and share the common classroom learning environment (Anderson, 1998). These elements of this study make it unique.

2.6 Ability Grouping in Secondary Schools

In the term 'ability grouping', 'ability' refers to ability as perceived by teachers or to achievement on common tests. In the UK and the USA, streaming is used to describe students who are grouped for all classes and the term 'setting' is used when students are grouped by subject. Tracking may describe either system (Steel, 2005).

In Australia, the term streaming is used to describe grouping by 'ability' in any learning area. The assumption is that ability grouping allows the teacher to increase the pace and raise the level of instruction and competition for high achievers and to provide more individual attention, repetition, and review for low achievers (Hollifield, 1987). This image that is created tends to find favour with most parents as they desire an appropriate level of instruction for their children. Ability grouping continues to be commonly used because it is perceived to create an easier role for the teacher, students learn and feel more positive about themselves and it lessens the sense of failure for slower students (George, 1996 as cited in DiMartino & Miles, 2004).

George (1996) stated that it is impossible to place students into ability-grouped tracks equitably and accurately when sorting on the basis of test results; that students do not do better academically when tracked with others like themselves; that students grouped in lower tracks have lower self-esteem; and that tracking produces no positive results (George, 1996 as cited in DiMartino & Miles, 2004). In a conversation with Jeannie Oakes about her publication *Keeping Track* (1985), Oakes stated that "you find low-track teachers with a classroom full of students who have a history of school difficulties, school failures, or misbehaviour" (O'Neil, 1992). Labelling students according to ability and assigning them to low-achievement

groups may also communicate self-fulfilling low expectations and these groups often receive a lower quality of instruction than other groups (Hollifield, 1987). Slavin (1987) sees, as the most compelling argument against ability grouping, the creation of academic elites, a practice which goes against democratic ideals. Results from his research indicate that regrouping for reading or mathematics can improve student achievement. However, the level and pace of instruction must be adapted to achievement level and students must not be regrouped for more than one or two subjects (Hollifield, 1987).

In a study by McGrail (1997), meeting the needs of high ability students can be as challenging as integrating disabled students in the classroom. High ability students can be delightful but can also be demanding, impatient, perfectionistic, sarcastic and disruptive (McGrail, 1997). Cooperative learning through traditional heterogeneous groups may be counter-productive for high ability students. When the learning task involves much drill and practice, these students often do more teaching than learning in such situations (McGrail, 1997). These students may benefit more from grouping based on the choice of task.

In a study conducted by Bartholomew (2000), many student responses showed that they considered there was something slightly 'special' about people who are good at maths. The rationality of mathematics, the image of the 'great mathematician' and the possibility of being regarded as particularly clever and can do well in maths, without being seen to take your work too seriously, seems to have a particular potency for middle class boys. In most of the upper level classes that were observed during the course of this study, the students who are regarded as being the 'best' in the class are those who display most confidence in lessons, are quickest to find answers, and who make sure everyone else in the group knows that they got there first-often a group of middle class boys (Bartholomew, 2000).

Interim results from a four-year longitudinal study monitoring the mathematical learning of students in six UK schools showed that approximately one-third of the students taught in the highest ability groups were disadvantaged by their placement in these groups because of high expectations, fast-paced lessons and pressure to succeed (Boaler, Willam, & Brown, 2000). The high ability groupings particularly

affected the most able girls and this resulted in anxiety for theses students (Boaler et al., 2000). From this research it seems likely that the underachievement and non-representation of girls at the highest levels is linked to the environments generated within top-set classrooms.

 This research by Boaler et al. (2000) also showed that if the pace in the lower ability sets was too slow, then disaffection occurred. It seems that when students were taught in mixed-ability groups, their mathematics teachers gave them work that was at an appropriate level and pace. When the students were divided into ability groups, students in the high sets came to be regarded as 'mini-mathematicians' who could work through high-level work at a sustained fast pace, whereas students in low sets came to be regarded as failures who could cope only with low-level work- or worse-copying off the board (Boaler et al., 2000).

Ireson, Hallam, and Plewis (2001) studied 45 English secondary schools and results from their research indicate that pupils' self-esteem and general school self-concepts are higher in schools with moderate levels of ability grouping than in tightly streamed or un-streamed schools. They also reported that girls have lower self-concepts in mathematics and science.

Their research indicated that ability grouping does not have a strong influence on attainment. Positive attitudes towards learning and positive self-concepts are important elements fostering a disposition to learn in the future (Ireson, Hallam, & Plewis, 2001). In the ideal situation, the goal of mathematics education is to expose students to practices that will enable them to see and view the world through mathematical lenses and to be successful participants (Zevenbergen, 2002).

The implementation of streaming appears to be more common in mathematics than other curriculum areas (Zevenbergen, 2002). The contemporary push in education for outcomes-based learning, where students' progress is mapped against levels, enables teachers to justify streaming on the basis that students can be exposed to content that matches their levels of understanding (Zevenbergen, 2002). Data in this study were collected through semi-structured interviews with students from six divergent schools in a region of Australia. The student responses followed a general

trend where the students in the high streams reported positive experiences, learned a lot of mathematics, performed better in tests and considered the discipline as relevant. The converse was true for those in the lower streams (Zevenbergen, 2002).

At the *Academic Improvement Magnet (AIM)*, an alternative academy in Roosevelt High School in Yonkers, NY, the teachers wanted their students to show up for school and catch up academically with their cohorts. Survey data and recent statistics have shown improvement in students' achievement by these teachers. This has occurred by using heterogeneous groupings and differentiated instruction which has created an atmosphere of equality and caring in the classroom and has offered the students a better chance of success (DiMartino & Miles, 2004).

Apart from the grouping system, classes differ in size, ability range within the class, teaching approaches, teacher competence and attitudes, curriculum, and resources. As the results from the debate on 'ability grouping' appears to remain unresolved, teachers can recognise that every class has a range of ability within it, and teach in a way that caters to a range of ability (Steel, 2005). This section has reviewed literature on collecting information on the effect of ability grouping on students, and has supported the idea that more research is needed on this topic.

2.7   Summary

In this chapter, the literature has been reviewed in the following areas: history of learning environments research (2.2), learning environment instruments (2.3), past learning environment studies (2.4), selection of instrument (2.5) and ability grouping in secondary schools (2.6). After researching ability grouping in secondary schools, there appears to be little or no research that uses learning environment instruments to examine the effect of homogeneous or heterogeneous grouping of students within a subject.

The following chapter describes the research methods used to collect quantitative and qualitative information on classroom environments.

CHAPTER 3
METHODS

3.1 Introduction

The previous chapter provided a review of literature on classroom climates, ability grouping of students and their effect on student learning outcomes. This chapter examines the research methods used for this research project. Good research practice obligates the researcher to triangulate, which is to use multiple methods in order to ensure the validity of research conclusions (Mathison, 1988). This study was designed to employ the triangulating of quantitative data, through the use of teacher and student surveys, and qualitative data using informal student interviews and classroom observations. A unique feature of this study was that the researcher was a participant-observer when qualitative data were collected from a subset of the student sample. The data were then fed back to the teachers so that they could refect on and make possible changes to their classroom environments to better meet the needs of the students.

3.2 Methodology

Educational research is not a collection of haphazard information and thoughts brought together for general discussion. The most important characteristic of educational research is that it is a disciplined, structured inquiry. This research project sets out to examine problems which relate to student learning and classroom environment. As a teacher, the researcher was in a setting where educational research could take place.

For this research problem the researcher has used action research methodology. Action research was considered the best choice for the research project because the emphasis in this study is on implementing changes to teaching practice to improve classroom climate.

Two attributes are privileged in action research:

> being a practitioner who is engaged in systematic reflection and action in relation to some aspect of his/her practice; and
> being able to engage in rational critical interpretation of evidence (Grundy, 1995).

Students can no longer be regarded as passive recipients of learning but are active constructors of the learning environment (Grundy, 1995). In this research project, the students were co-participants in the research that has taken place. The students contributed to data collection by completing questionnaires and a subset of students participated in semi-structured interviews. The quantitative and qualitative data that were collected from students and teachers became the starting point for the participating teachers' journey of action research to begin. Teachers were able to discuss the results collected about their classrooms learning environment in a collaborative nature with the researcher. At this stage, the teachers were able to reflect on this information, plan what they were going to do to improve the learning environment and begin implementing these changes. This was the beginning of a cyclical process which can then continue at a later date, where teachers are able to reflect upon the results of these changes and make judgements about the improvement that has occurred.

No longer is one educational research approach sufficient to conduct successful educational research. Shulman (1997) states that the best research programs will reflect intelligent deployment of a diversity of research methods applied to their appropriate research questions.

In this research project, questionnaires were used to collect the quantitative data and semi-structured interviews and classroom observations were used to collect the qualitative data. The use of multiple data sources, data collection methods and theories to validate research findings is known as triangulation (Anderson, 1998). Triangulation helped to detect differences in participant perceptions of the learning environment and as seen in Fraser and Tobin's study (1991) greater credibility could be placed on the data and this helped to eliminate bias. The procedures are highly

structured in approach and the data collected has been carefully analysed. Self-correction and refinements occurred in this directional but unhurried activity. The emphasis for this research is on the teachers using this collected data, to make improvements and change to their teaching, which will then lead to a more positive classroom environment.

Being part of the classroom situation, as classroom teacher or Numeracy Support teacher, allowed the researcher to take on the role of primary researcher in some of the classrooms. Anderson (1998) states that a fundamental assumption of the qualitative research paradigm is that a profound understanding of the world can be gained through conversation and observation in natural settings. The researcher recorded the activities that occurred in these classrooms as a participant-observer.

Informal interviews and exchanges with students have been recorded. An interview is defined as a specialized form of communication between people for a specific purpose associated with some agreed subject matter (Anderson, 1998). It was important to gain much of this qualitative information about the classroom through the eyes of the students because they are part of the environment and have had time to form accurate opinions. The quantitative survey used, also enabled information to be collected through the eyes of the students.

These two procedures, namely quantitative surveys and informal interviews, complement each other, add to rigour of the study and also allow for triangulation. The questionnaire aligns itself with the normative paradigm in which the data will be statistically analysed. The normative paradigm uses methods of natural science. This means that the theory precedes the research. The researcher uses traditional methods of surveys and experiments and then statistically analyses the data. The normative studies are positivist, where the researcher remains in an observer role. For them, basic reality is the collectivity; it is external to the actor and manifest in society, its institutions and its organizations (Cohen, Manion, & Morrison, 2000). The normative (or positivist) approach view knowledge as hard, objective and tangible. Positivism may be characterized by its claim that science provides us with the clearest possible ideal of knowledge (Cohen et al., 2000). Using the normative paradigm, the procedures and results are able to be readily checked by other

researches. The normative approach considers that human behaviour is passive and controlled by external forces. It does not take into account the individual's ability to interpret their own experiences or the need for the researcher to share the individual's environment, so that they are able to understand the individual's interpretation of their environment.

The interview method aligns itself with the interpretive paradigm where the researcher is no longer a mere observer, but becomes involved with the students. The interpretive paradigm shows more concern for the individual (Cohen et al., 2000). There is an effort from the researcher to get inside the person and understand from within. The theory is emergent and follows the research. The interpretive paradigm aligns itself with a post-positivistic approach. The knowledge is personal, subjective and softer than a positivistic approach. The interpretive paradigm uses less well-developed and understood methods but the British philosopher, Alfred North Whitehead observed: "some of the major disasters of mankind have been produced by the narrowness of men with a good methodology …. To set limits to speculation is treason to the future." (cited in Shulman, 1997, pp. 23-24).

The questionnaire does not take into account the fact that the researcher shared the student's classroom and therefore was able to understand better than non-participant observers the student's interpretation of their learning environment. In this study, the situation was even better because the researcher was already familiar with most students and classroom environments. Overall, validation of the data occurs because of triangulating the quantitative and qualitative data.

The researcher checked the information that had been recorded with the students, to strive for internal validity, but the information will not be able to be replicated in another setting. The data obtained from the research need to be able to withstand the scrutiny from the other teachers involved in the project, as well as persons interested in this educational problem. Therefore, feedback from teachers was a vital component of validation in this study.

3.3　Data sources

The learning environment in which the study occurred was a country high school with a school population of 710 students, enrolled in Year 8 through to Year 12. This school is classified as a Band 2 school, as it draws many of its students from a low socio-economic area.

The sample for this study involved students from the Year 8, Year 9 and Year 10 mathematics and science classes. Both the Year 9 and 10 mathematics classes are streamed. All science classes are mixed ability classes, except for an upper stream Year 10 science class. All mathematics classes and a sample of science classes have been used in the study. Brekelmans (1989) conducted a generalizability study and concluded that the QTI should be administered to at least ten students in a class for the data to provide reliable feedback to teachers. All classes involved in the study contain more than ten students. This sample has been chosen from the Year 10 cohort so that the one streamed science class can be included in the study, and from the Year 8 cohort where classes and the same students as the Year 8 mathematics classes.

The sample of 537 student QTI responses formed the quantitative part of the data collection. The sample consisted of 256 male students and 281 female students. The sample included 366 mathematics questionnaires and 171 science questionnaires. There were 12 teachers involved in the study and 25 classes. A subset of this sample was used to assess if the attitude to class varies with streaming or subject.

The qualitative data were collected from a subset of this sample, in five classes. One of these classes was a low ability Year 9 class in which the researcher works as a Numeracy Support teacher.   The information collected from interviews and classroom observations is an essential part of supporting the validity of the questionnaires.

The percentage of students in the sample population for this study reaching the *Western Australian Government Standard Achievement Target* (WAGSAT) on the Year 9 *Monitoring Standards in Education* (MSE) test for Mathematics is below the

State percentage. The students performed below the State average when compared with the Numeracy Benchmark target.

3.4   Role of participants

The responsibility for ethical research ultimately lies with the individual researcher (Anderson, 1998).   Researchers are bound by ethical standards, professional standards and their own personal code of ethics. An ethic of care realigns the notion of power in a conventional research relation, and is critical in work-based projects to prevent the potential for exploitation (Gibbs, 2004). Working within the school, requires the researcher to undertake a caring approach when dealing with the colleagues and students involved in the research project.

Using the methodological approach of action research, the researcher has taken on the dual roles and responsibilities of teacher-researcher. Unlike outsiders whose first priority might be the creation of knowledge, teacher-researchers have a primary obligation to the welfare of their students (Bournot-Trites & Belanger, 2005). The researcher worked with colleagues who were temporarily transformed into research subjects.   The work of a practitioner researcher takes place on the inside of the political context of work, where the researcher may be in a powerful position in relation to the subjects, caused by the research methodology used (Costley & Gibbs, 2006).   An 'ethics of care' should prevail to safeguard my personal and moral relations to these colleagues.

The information obtained from the questionnaires was discussed with teachers involved in the project so that they could reflect on and implement changes in their classrooms (debriefing). The information was not to be used to 'rate' teachers on their performance. The information was for their use, but they may wish to discuss the information with other colleagues when they are deciding on plans to implement, after their reflection. The students were not 'taken to task' for their responses.

Before undertaking the collection of data, the research project was discussed with the School Principal, Head of the Mathematics and Science Department and with the teachers that were to be directly involved in the project. After their permission and

support were gained, the project was able to proceed. An information sheet (as required for ethics approval and found in Appendix D) was given to the Principal to explain the purpose and methods to be used in the research project. Convincing others is a matter of persuading them to accept the values the researcher holds about the objects and phenomena being studied as well as about the very purpose of the research itself (Yore, 2003).

The involved participants must be informed of the nature and purpose of the research, its risks and benefits, and must consent to participate without coercion (Anderson, 1998). Both the teachers and students were informed participants of the research project. Because the participants in the study are young students, consent forms were sent home containing information about the project to parents (Appendix E). This information sheet was distributed to teachers participating in the study. Zeni (2001) raises the question of beneficiaries: "Will my students benefit from my research or will I be using them for my own gain?" The feedback provided to teachers involved in the study, can be used so that they can put into place intervention strategies to help improve classroom climate. By taking positive steps to improve the learning environments of our Year 8, 9 and 10 classes, an improvement in the learning outcomes of our students may be achieved. Furthermore, the students were not disadvantaged by not participating in the study.

As Zeni (2001) points out, the classroom teacher and students are not the only ones impacted by research carried out in a school. Parents were impacted in that they read the consent form (Appendix D) and decided whether or not to allow their children to participate. At the sample school, two newsletters are mailed to parents each term, so the information sheet and consent form were included with one of these newsletters. This ensued that all parents received the information sheet and consent form. The National Health and Medical Research Council (NHMRC) guidelines for ethical research were followed.

As teacher-researcher in this project I have the knowledge of who consents and who refuses for this project. Parents and students are not unaware of the subjective nature of classroom interactions and the importance of being liked by the teacher (Bournot-Trites & Belanger 2005). The researcher was available for parents to contact if they

had concerns at any stage during the project and to reassure them that their child would not be jeopardized in any way, if they did not take part in the research project. Only one parent decided to withdraw their child from the project. This student was new to the school, so the researcher was not a known entity to the student's parents.

The researcher administered the QTI and Attitude Scale within the questionnaires to all Mathematics classes and conducted the informal interviews with a subgroup of students. Where the researcher was unable to administer the QTI, the classroom teacher administered the test, and the surveys were immediately returned to the researcher by a class member. This ensured that student confidentiality was maintained.

3.5   Data collection

Using the QTI also enables information to be collected through the students. In all mathematics classes, the two teacher versions of the QTI and the student version of the QTI were administered by the researcher at the same time. The teachers were able to fill out both questionnaires in the same length of time as the students completed their questionnaires. This then removed any perception by the students, that the teacher was involved in the collecting of the data. The students were then more inclined to answer the QTI truthfully, as there was less concern about a negative response from the teacher. After having completed the questionnaires in their mathematics classes, the students were familiar with the format. Science teachers then administered the questionnaires during the normal course of their science lessons. A student collected their fellow classmates' responses, so that they could be returned immediately on completion to the researcher, thus ensuring student confidentiality.

The teacher completed a learning environment instrument which measures their perceptions of the 'actual' classroom environment and then another form which measures their perceptions of the 'ideal' classroom environment. There is a change in the wording of the questions to suit the different instruments, for example, 'I talk about' becomes 'The teacher would talk about'. The students wording becomes 'This teacher talks about'.

Although the QTI is a valid and reliable instrument (Fisher et al. 1996), some students had difficulties in understanding words such as 'lenient', 'hesitant' and 'sarcastic'. These words were explained to the whole cohort. The questionnaire was quickly and easily administered and took about 20 minutes of class time.

The three versions of the QTI contain 48 items, six for each scale of the model of interpersonal teacher behaviour. This model consists of eight sectors, each describing behaviour aspects: Leadership, Helpful/Friendly, Understanding, Student Responsibility and Freedom, Uncertain, Dissatisfied, Admonishing and Strict behaviour. The higher the scale score, the more a teacher shows behaviours from that sector. These items are answered on a five-point Likert response scale, ranging from 0-4 where 0 represents Never and 4 represents Always. When the three versions of the questionnaires (QTI) were completed, the totals for each scale for each version were determined and the means calculated (Fisher et al. 1996). These data were entered onto an Excel spreadsheet. Three sector profiles were plotted, which show the classroom interpersonal teacher-student behaviours for each individual teacher. This gave the teacher a visual representation of their ideal teacher, how they see themselves and how the students see them. The information was also plotted in an alternative form using line graphs, as some teachers felt more comfortable with a presentation that they were more familiar with.

Care was taken when collecting information during the informal interviews so that these sessions were not used as a chance to begin discussing personal issues that they had with their teacher. Students realised that comments of a personal nature were not acceptable or taken as valued information. These discussions were held during the normal course of the lesson so that minimal disruption occurred to the students learning time. These informal discussions were held with groups of two to four students. The groups selected consisted of students who chose to sit together in class and were comfortable with each other. It was found that the students were more forthcoming with opinions in this type of grouping. These interviews occurred during the later part of the school year. The students reported that they were comfortable talking to the researcher who was known quite well because of her role as teacher or support teacher within their classroom. Students were not inhibited with their responses. I felt that their answers had been truthful and valid. The

students showed maturity during the interviews, as they felt valued as individuals and realised that their comments were of importance. Students grouped in a similar cohort for their Mathematics and Science classes were asked to comment on similarities and differences between the two classroom environments.

Some of the students involved in this study had completed questionnaires earlier in the year as part of another project, and reported that their enthusiasm for filling out another survey had waned a little. Because of this reason a decision was made not to use a Normative Interview structure where only quantified responses of Yes or No were to be given. The students were then able to express their 'feelings' in a more expansive way. They were very 'keen' to have their opinions heard. Most of these informal interviews were conducted within the classroom. The Year 8 students however, were removed from the main classroom area so that there was less influence from their peer group. Once the students were assured that they were 'not in trouble', there was no noticeable difference in conducting these semi-structured interviews in or out of the main classroom area.

The role of primary researcher occurred in classes where the researcher was either the classroom teacher or the Numeracy Support teacher. This allowed for observations to be recorded at the conclusion of these lessons. The use of triangulation, by having three data collection methods, has helped validate the research findings. The value of using triangulation has been that it has provided evidence needed so that explanations of teacher-student interpersonal behaviour can be given.

3.6   Summary

This chapter has reviewed the research methods used to frame this research project. A detailed account of the data sources and roles of the participants has been included in this chapter. The next chapter gives detailed results of the data that were collected from quantitative and qualitative sources. These results are displayed in the form of graphs and an interpretation of these graphs is given. The graphs are in the form of some sector profile plots and line graphs to display the teachers' profiles for each of their classes.

CHAPTER 4
RESULTS

4.1 Introduction

The previous chapter described the research methods that were used to collect data for this research project. This chapter reports on the validation of the questionnaire, presents detailed results from the quantitative data in the form of line graphs, some sector profile plots, and gives a written account of students' comments. Initially, both sector profile plots and line graphs were presented to some of the teachers. After discussions with these teachers, it was found that an easier, clearer and more objective comparison between different perceptions of the learning environment was gained using the line graphs, instead of the traditional sector profile plots portrayed in much of the literature. The sample used contains heterogeneous (mixed ability) and homogeneous (like ability) groups. The homogeneous groups consist of upper, middle and lower stream mathematics and science classes.

Twelve teachers have participated in this study. The quantitative results from each class taught by a particular teacher participating in this study have been grouped together. Qualitative information collected by informal interviews from a subset of the students is included for the first three teachers. These interviews were used to add a greater depth of understanding to the data and help validate the quantitative data in a student-centred way.

The data collected from most mathematics teachers and one science teacher consist of information from heterogeneous and homogeneous classes. Presenting the data from all classes taught by a particular teacher together, allows further comparisons to be made about the different perceptions of the classroom interpersonal behaviour between their heterogeneous and homogeneous learning environments. This sample provides data from a unique situation within the Mathematics Department, where two year groups (Year 9 and Year 10) are arranged by streaming according to 'ability grouping' but the third year group (Year 8) contains students of mixed-ability. Similarities and differences between the teachers' classes can be examined to see if streaming does affect student and teacher perceptions of their classrooms for students

in the same school, level, climate and learning environment. This assists by reducing other variables that may influence the outcomes if the sample was comprised of different school sites.

4.2 Validation of the Questionnaire

The QTI was given to all students and teachers involved in the research project. Brekelmans (1989) conducted a generalizability study and concluded that the QTI should be administered to at least ten students in a class for the data to provide reliable feedback to teachers. In this study, the QTI and an Attitude Scale were administered to all classes. This study aimed to have all students in a class participate, therefore, all classes involved in the study contain more than ten students. The researcher's aim was to sample all students in all classes participating.

Table 4.1 presents the information for the QTI when used in mathematics and science classes in the sample school. The data were collected from 25 classes and over 500 students contributed to the study. If each item in a scale measures the same aspect of behaviour for any teacher, then it can be described as 'homogeneous' or having internal consistency (Wubbels & Levy, 1993). As in earlier research, when the three versions of the questionnaires (QTI) were completed, the totals for each scale for each version were calculated, together with the mean for student perceptions (Fisher et al., 1996). Associations between streaming and teacher-student interpersonal behaviour were then examined and reliability and validity statistics were calculated.

The Cronbach alpha reliability was used to enable a more detailed comparison of classes and the instrument to be used. Table 4.1 also presents the Cronbach alpha results for each scale of the QTI. The two units of analysis that were reported statistically were the class mean score and the student's individual score. As expected and found in previous studies (Rickards & Fisher, 1996), the reliabilities for class means were higher than those where the individual student was used as the unit of analysis. Using the class mean as the unit of analysis gave results between 0.80 and 0.98. The standard often used for internal consistency reliability is 0.60 (Nunnally, 1978), so the results from this study were considerably higher than this

value. Using the individual score as the unit of analysis gave results between 0.64 and 0.88. Thus, these results showed internal reliability and consistency comparable with previous research (Rickards & Fisher, 1996).

Another useful characteristic of most learning environment instruments is their ability to differentiate between the perceptions of students in different classrooms. That is, the mean perceptions of students within the same class should show some similarity, while mean class perceptions should vary between classes. For each of the eight scales of the QTI, this characteristic was examined using a one-way ANOVA, with class membership as the main attribute. It was found that each scale did differentiate significantly ($p<0.001$) between classes. The *eta*^{2} statistic, representing the proportion of variance attributable to class membership, ranged from 0.18 to 0.45 for different scales.

Table 4.1

Internal Consistency (Cronbach Alpha Coefficient) and Ability to Differentiate Between Classrooms for the QTI

Scale	Unit of Analysis	Alpha Reliability	ANOVA Results (eta^2)
Leadership	Individual	0.79	.38*
	Class Mean	0.95	
Helping/Friendly	Individual	0.88	.45*
	Class Mean	0.97	
Understanding	Individual	0.88	.38*
	Class Mean	0.98	
Student Responsibility/ Freedom	Individual	0.66	.23*
	Class Mean	0.80	
Uncertain	Individual	0.77	.30*
	Class Mean	0.90	
Dissatisfied	Individual	0.86	.28*
	Class Mean	0.95	
Admonishing	Individual	0.82	.42*
	Class Mean	0.93	
Strict	Individual	0.64	.18*
	Class Mean	0.80	

*$p<0.001$ n = 537 students in 25 classes

4.3 Whole School Quantitative Results

The results, in the form of mean scores and standard deviations for students, for the total sample have been presented in the Table 4.2. This information has then been presented in a line graph so that comparisons can be made between the forms of the QTI and with an earlier Australian study.

Table 4.2

Mean QTI Behaviour Scores for Student, Actual Teacher and Ideal Teacher and Student Standard Deviation.

Scale	Mean Student	Mean Actual	Mean Ideal	Standard Deviation Student
Leadership	2.28	2.76	3.77	1.25
Helping/ Friendly	2.27	2.97	3.72	1.32
Understanding	2.37	2.91	3.72	1.20
Student Responsibility/ Freedom	1.59	1.53	1.24	1.06
Uncertain	1.34	0.9	0.34	1.15
Dissatisfied	1.42	1.44	0.95	1.24
Admonishing	1.65	1.21	0.5	1.28
Strict	1.78	1.85	1.99	1.19

n=537 students in 25 classes
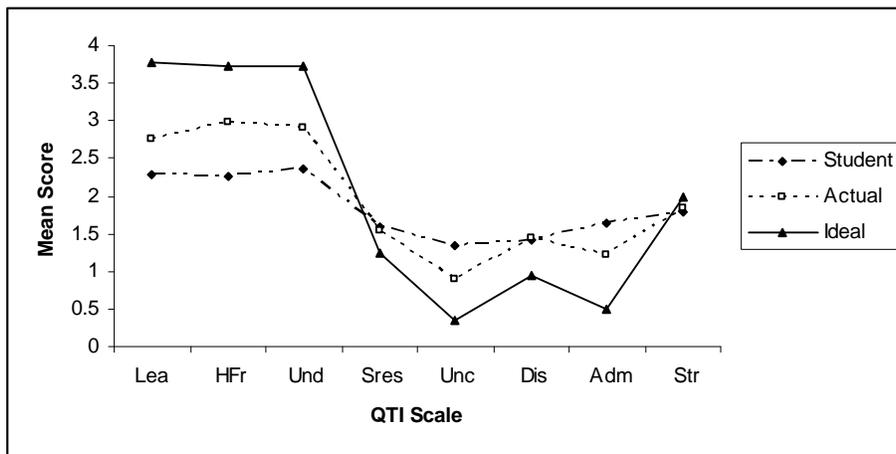
Figure 4.2. Profiles of mean QTI scores for whole school.

The teacher profiles at this school follow a similar pattern to those found in an earlier study conducted in Western Australia and Tasmania, which used a sample of 792 Year 11 science and mathematics students (Wubbels, 1993). Except for dissatisfied behaviour, the average teachers' perceptions of their behaviour take a position between the students' perceptions of actual behaviour and the teachers' ideal perceptions. These results showed consistency with the earlier study. The student and teachers' actual perceptions of leadership, helpful/friendly and understanding behaviours were lower than was found in the previous study. These results may have varied due to the different year levels being used in each study. This study involved Year 8, 9 and 10 students as the participants, whereas participants in the earlier study where selected from the Year 11 cohort.

4.4 Teacher and Students Quantitative and Qualitative Results (Teachers 1 to 3)

The average teachers' perceptions of their own behaviour generally takes a position somewhere between the students' perceptions of actual behaviour and the teachers' ideal (Wubbels, 1993). Usually, teachers think that they behave closer to their ideal than the students think that they do (Fisher et al., 1996). The self-perception of the teachers is compared with their ideal perception and the perception of the students in the following graphs and sector profile plots to see if a gap has occurred between their profile behaviours. A (0-4) format has been used to plot the graphs because the

QTI uses a five-point Likert response scale, ranging from 0 to 4 (Never to Always). Teacher 1 was chosen because the role of teacher/researcher overlapped. Teacher 2 was chosen because the researcher was the Numeracy Support Teacher in that classroom. Teacher 3 was chosen because similar groups of students were taught by Teacher 1. The researcher was well known to the students in these three situations, so discussions were comfortable and could occur in normal class time.
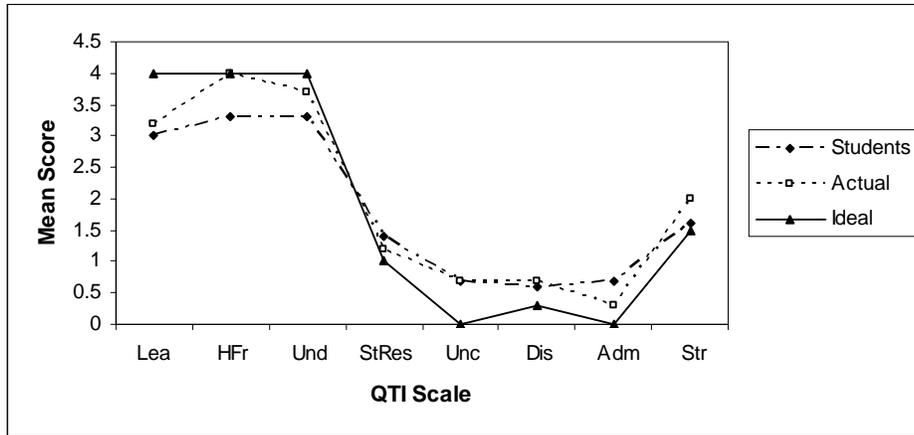
Figure 4.3. Graph of Teacher 1 (Year 9 upper stream mathematics class).

In reference to Figure 4.3, the teacher's self perception of herself matches fairly closely to the students' perceptions of the classroom environment. This classroom appears to be a positive learning environment where the teacher's positive behaviours of leadership, helpful/friendly and understanding behaviours are more strongly represented than negative behaviours of uncertain, dissatisfied and admonishing behaviours. This class is an upper stream Year 9 mathematics class.

The sector profile for this teacher is shown in Figure 4.4. From this, it can be seen that the students perceive the teacher to have sightly less helpful/friendly and understanding behaviours and slightly more admonishing behaviour than the actual teacher's perception. There is less difference shown between the students' perception and teacher's self perception of teacher-student interpersonal behaviour than between the teacher's self perception and their ideal.

Teacher 1
(Ideal Perception)
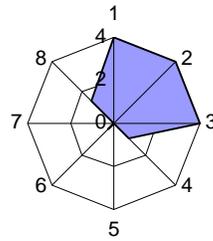
Teacher 1
(Actual Perception)
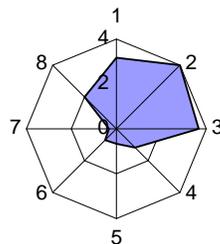
Teacher 1
(Student Perception)
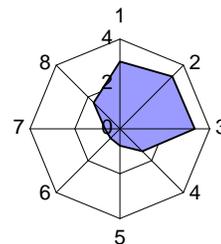
Figure 4.4. Sector profile of Teacher 1.

Comments from students in the upper stream Year 9 mathematics class (Teacher 1) help to confirm the validity of the quantitative data. One of the boys said that:

> *The classroom was a good work atmosphere where the right level of explanation was given.*

His friend said that it was a more formal classroom but was 'all good'. A group of girls from this class felt that being a stricter classroom was for the better. One female student said that:

> *This class is stricter which is better.*

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Another female student commented that:

I like the feeling of being looked after.

They all felt that when they needed direction they were getting enough help. This group of girls did not feel pressured in this upper stream class and said that the pace of the lessons was good.

The following graph shows the perceptions in another class taught by the same teacher. This class is a heterogeneous Year 8 mathematics class.
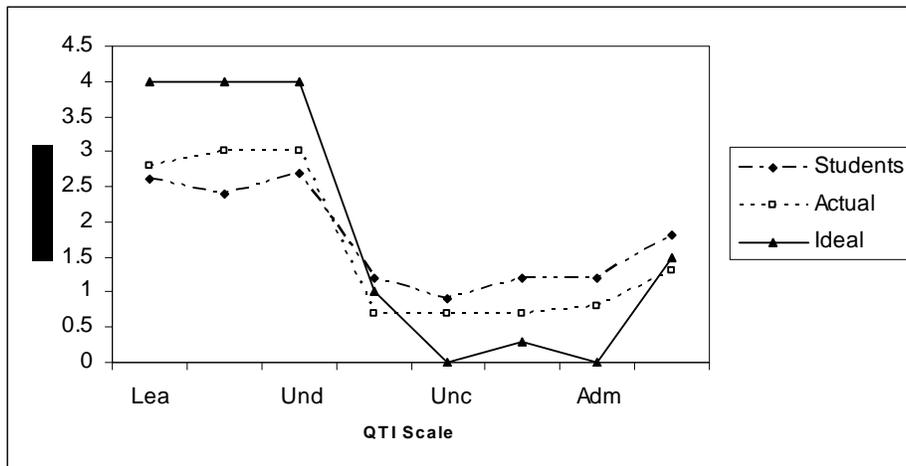
Figure 4.5. Graph of Teacher 1 (Heterogeneous Year 8 mathematics class).

Both the teacher and the students perceive this classroom to not be functioning as well as the previous class. Students perceive their teacher to be showing less helpful/friendly and understanding behaviour but more dissatisfied, admonishing and strict behaviour. Although the pattern for both classrooms is a similar shape, both the teacher actual and students' perceptions of the environment are further away from the ideal in the second classroom situation in leadership, helpful/friendly and understanding behaviour.

The group of students in this Year 8 mathematics (Teacher 1) felt that their mathematics class was controlled but fair. Examples of comments from these students are:

> *We are given some responsibility.*

> *Even though the desks are separated, we are allowed to sit close to our friends.*

The students commented that this teacher appeared more competent, but sometimes did get angry. This matches the QTI data where students perceive the teacher to exhibit greater admonishing and strict behaviour than the teacher's perception.

The third class of Teacher 1 is an upper stream Year 10 Mathematics class.
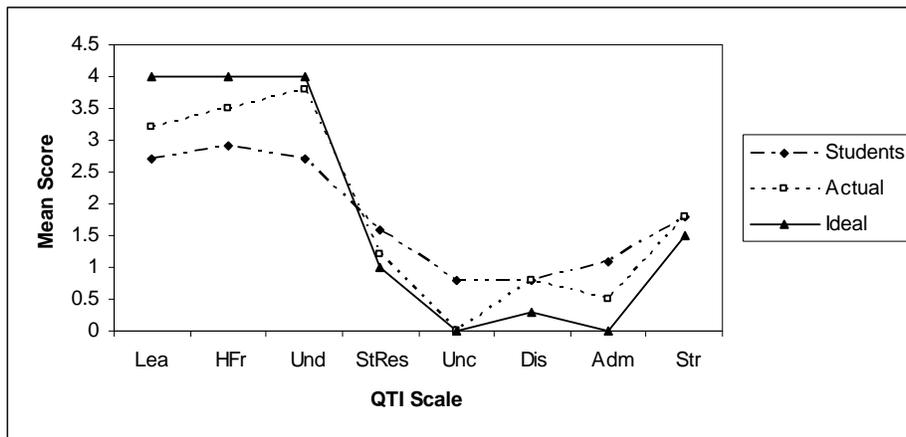
Figure 4.6. Graph of Teacher 1 (Top stream year 10 mathematics class).

The students perceive the teacher to be lower in leadership, helpful/friendly and understanding behaviours and more in uncertain and admonishing behaviours than the teacher believes herself to be. The students' perception of this Year 10 top stream class is very similar to the Year 8 heterogeneous class.

When the informal comments and other qualitative data were examined, male students in the upper stream Year 10 mathematics class (Teacher 1) commented that:

We are able to have a laugh with the teacher but have respect for the teacher, so listen when we are being taught.

The teacher is helpful and easy to get along with.

They preferred the controlled classroom environment. A group of girls in this class enjoyed the friendly atmosphere and liked the level of teacher-student interaction 'not too much but just the right amount'. Two of the girls said there was flexibility shown in the classroom. These girls said they 'know when the teacher has had enough', so were conscience of the clear boundaries set. They appreciated that they were not being judged by the teacher and generally managed the work because of the extra understanding and support shown by the teacher. One student commented that:

The teacher 'makes you work but not hate her'.

The following graph shows the perceptions of a lower stream Year 9 mathematics class.
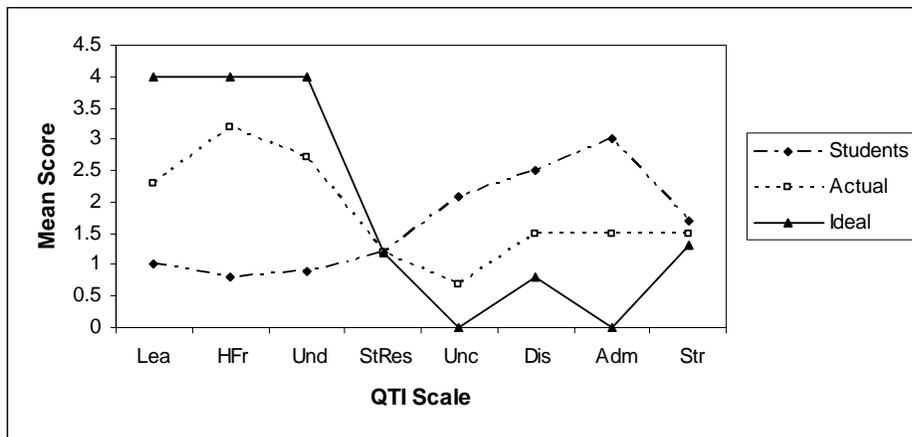
Figure 4.7. Graph of Teacher 2 (Low stream year 9 mathematics class).

As shown in Figure 4.7, there appears to be little similarity between the students' and teacher's actual perception of the teacher's behaviour where positive behaviours are more strongly represented by the teacher. This teacher's behaviour appears to be more strongly represented in the negative behaviours of uncertain, dissatisfied and admonishing by the students than the teacher's actual perception of his behaviour. A positive outcome is that it is much clearer where positive change could be made.

The teacher perceives himself to be much closer to his ideal than the students' perceptions. The students view the teacher as being very low in the areas of leadership, helpful/friendly and understanding but high in the area of dissatisfied and admonishing. The students' and the teacher's actual and ideal perceptions are the same for student responsibility and are close for strict behaviour. The possible reasons for the large difference in student and teacher perception will be discussed in Chapter 5.

The sector profile for this teacher is shown in Figure 4.8. This clearly shows that the students have a very different perception of the classroom interpersonal behaviour to that of their teacher, with their teacher's behaviour in the Proximity dimension (Cooperation-Opposition) concentrated in the Opposition sectors.

**Teacher 2
(Ideal Perception)**

**Teacher 2
(Actual Perception)**

**Teacher 2
(Student Perception)**
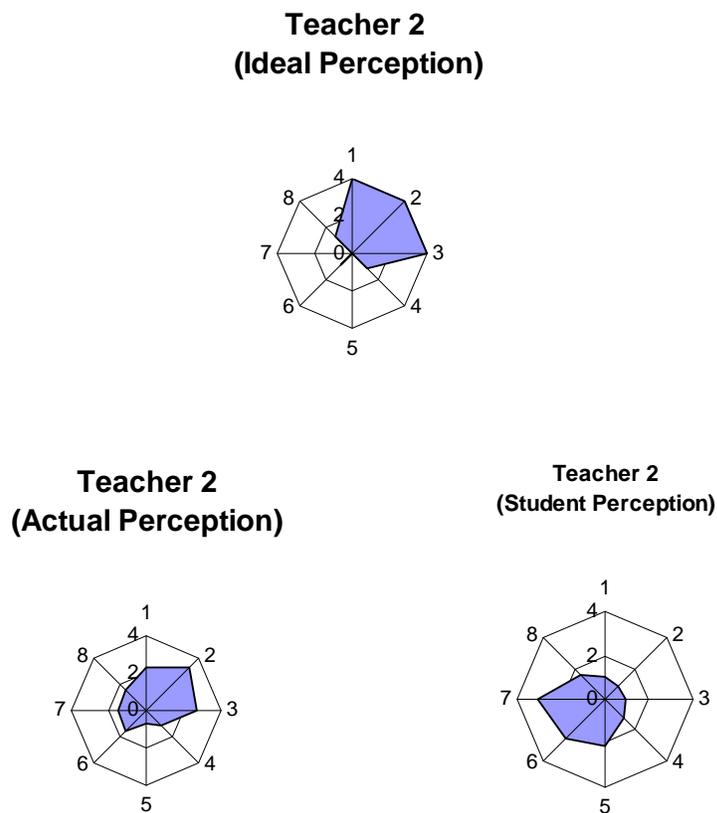
Figure 4.8. Sector profile of Teacher 2.

Comments from the students in this lower stream Year 9 mathematics class (Teacher 2) support the QTI data. Most students in this class felt the need for more positive feedback and even though they are aware that they are in a low ability class, do not like being made to feel that are not able to learn. During the informal discussions some of the students communicated that they considered the work too easy. One of the girls said that:

> *The teacher doesn't give them a chance to take responsibility.*

> *We are not allowed to move our desks and sit with our friends.*

One student said that the teacher gets frustrated and misses a step in the discipline process:

> *He sends us straight to upper-school isolation without using the intermediate steps of warnings and in-class isolation.*

Some students felt scared and uncomfortable when the teacher raised his voice and did not want to come to class. Some of the students took offence to some of the negative comments directed at them, for example, 'Don't play dumb' and 'You are just an attention seeker'. These comments from the students supported the findings from the students' version of the QTI. My experience as participant-observer of this classroom would also support these findings.

The following graph shows the perceptions in another class taught by the same teacher. This class is a heterogenous Year 8 mathematics class.
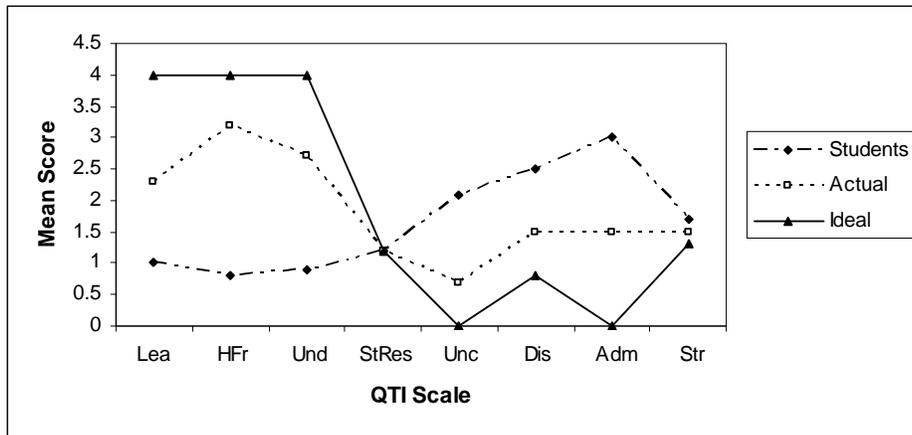
Figure 4.9. Graph of Teacher 2 (Heterogeneous Year 8 mathematics class).

A similar pattern has occurred for both classrooms taught by Teacher 2. These students perceive the teacher to be more admonishng than the teacher's actual or ideal perceptions and also stricter than the previous class's student perceptions.

The next graph shows the perceptions of a heterogenous Year 8 Science class.
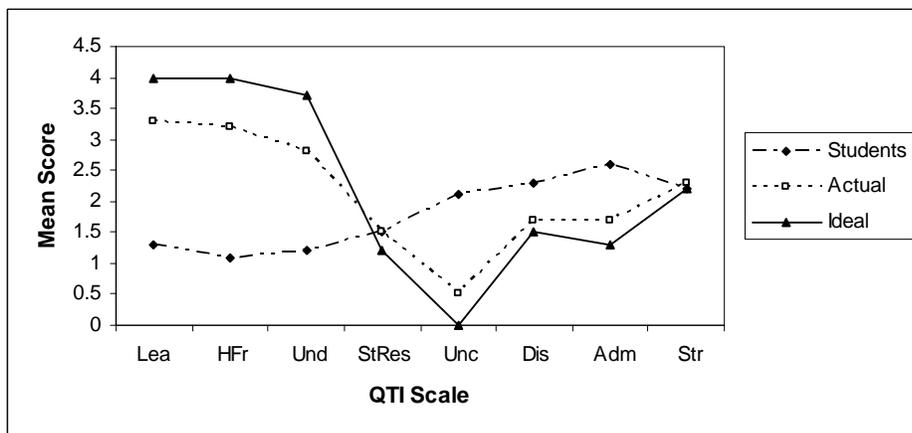
Figure 4.10. Graph of Teacher 3 (Heterogeneous Year 8 science class).

This class is the same group of students as the Year 8 class taught by Teacher 1. Generally in the literature from classroom learning environments, a class is described as positive if the behaviours represented in the class frequently demonstrate the scales of Leadership, Helpful/Friendly and Understanding. In reference to Figure 4.10, this class appears to have a more negative environment because the leadership, helpful/friendly and understanding behaviours are low but the uncertain, dissatisfied

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and admonishing behaviours are high. The teacher's actual and ideal perceptions follow a similar pattern but this shows a marked contrast with the students' perceptions of the classroom environment.

The sector profile for this teacher is shown in Figure 4.11. The students have a different perception of the classroom interpersonal behaviour to that of their teacher with the teachers' behaviour in the Proximity dimension (Cooperation-Opposition) concentrated in the Opposition sectors.

**Teacher 3
(Ideal Perception)**

**Teacher3
(Actual Perception)**

**Teacher 3
(Student Perception)**
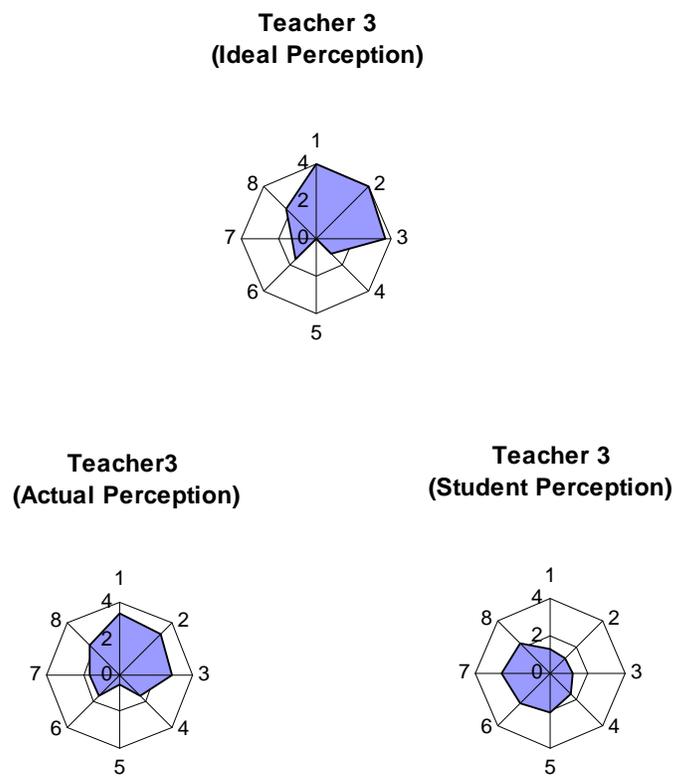
Figure 4.11. Sector profile of Teacher 3.

A group of girls from a Year 8 science class (Teacher 3) commented that:

> *There is little control in the classroom and not much work is done in this class.*

They also considered that the teacher needed to show more trust in them and that the teacher got angry quickly. One of the more able male students said that he did not 'feel good' about being in the class. He also commented that:

The teacher gets angry quickly.

The data collected from these informal talks appear to be consistent with the quantitative data. This same group of students felt that their mathematics classroom (Teacher 1) was a preferable environment as there was more control but the students were given some responsibility.
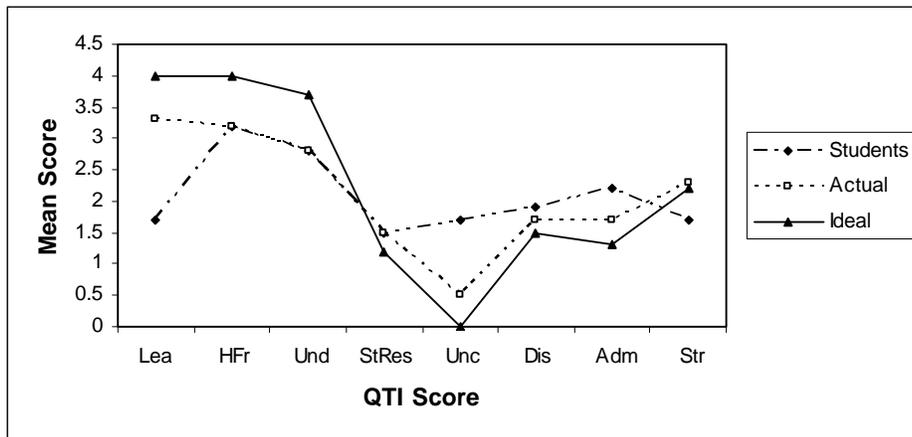
Figure 4.12. Graph of Teacher 3 (Heterogeneous Year 8 science class).

The next graph presents the data of an upper stream Year 10 science class taught by Teacher 3. This group of students is very similar in composition of students to the upper stream Year 10 mathematics class taught by Teacher 1.
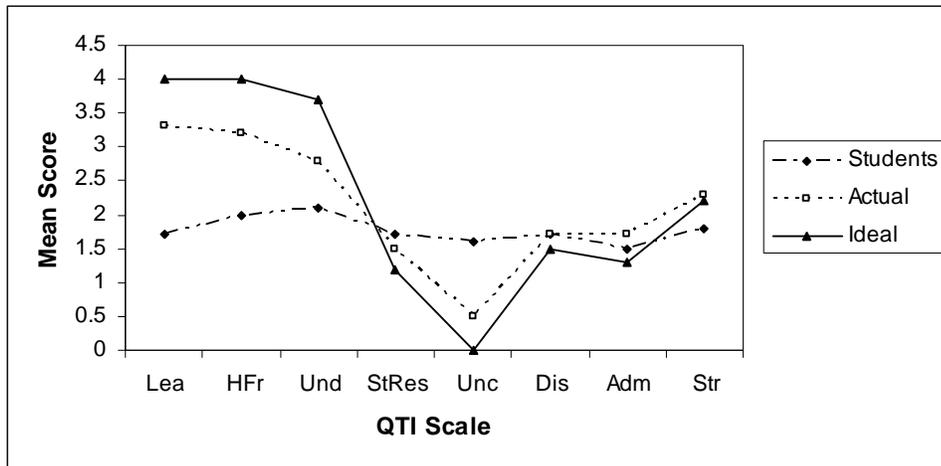
Figure 4.13. Graph of Teacher 3 (Top stream Year 10 science class).

This teacher's actual and ideal perceptions of dissatisfied, admonishing and strict behaviours align themselves closely to the students' perceptions. The students perceive less leadership, helpful/friendly and understanding behaviours than their teacher.

The group of students in the upper stream Year 10 science class (Teacher 3) is very similar to the upper stream Year 10 mathematics class (Teacher 1). Both the girls and boys in this group considered that Teacher 3 had very little control of their class. A number of students commented in a similar manner to the following:

Even when the whole class is talking, the teacher keeps teaching.

Typically, the boys said that:

The teacher gets angry quickly and moves too rapidly though the new work before a clear understanding is reached by the students.

One of the girls said that it sounds like 'he is talking to little kids' and 'he can't take a joke'. This comment aligns itself closely with question 41 on the QTI - 'This teacher can take a joke'. This demonstrates why reliability was good for students in this group and perhaps in the entire sample, as the students' perception also showed less Helpful/Friendly behaviour.
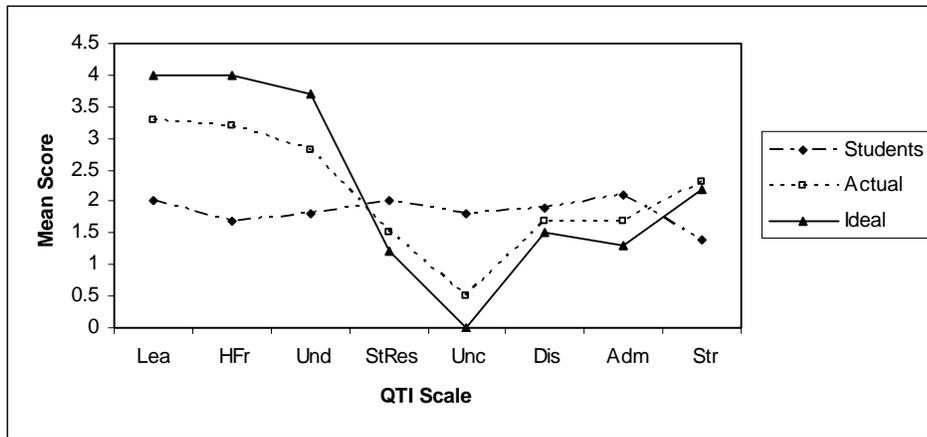
Figure 4.14. Graph of Teacher 3 (Heterogeneous Year 10 science class).

The students have a different perception of the classroom interpersonal behaviour to that of their teacher. They perceive less leadership, helpful/friendly and understanding behaviours and more uncertain behaviour.

The students in the three classes taught by Teacher 3 all perceive the teacher to be more uncertain in his behaviour than his own perception. The students in the three classes also perceive less strict behaviour than the teacher's own perception.

4.5 Teacher and Students Quantitative Results (Teachers 4 to 12)

The following graph shows the perceptions of the second lower stream Year 9 mathematics class.
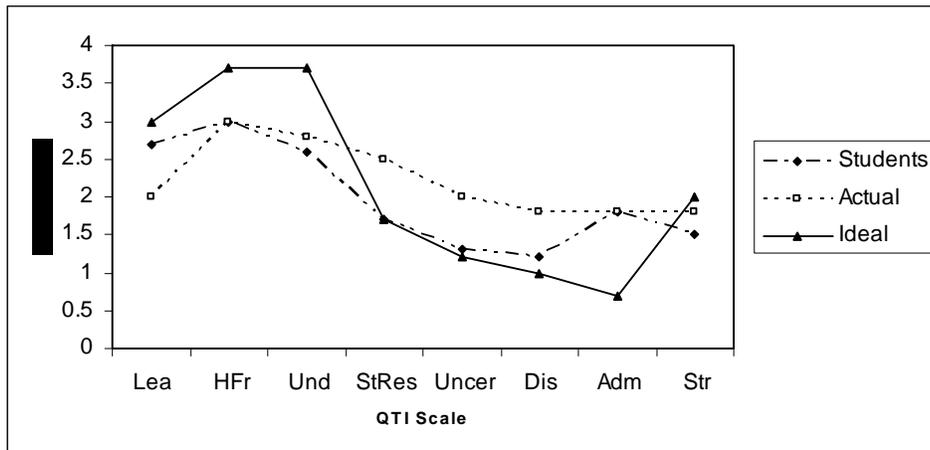
Figure 4.15. Graph of Teacher 4 (lower Stream Year 9 mathematics class).

The students perceive the teacher in a more favourable light than the teacher perceives himself. They consider that the teacher shows greater leadership behaviour than he believes and this is close to his ideal. The students also perceive the teacher to have less uncertain and dissatisfied behaviour than the teacher considers he demonstrates.

The sector profile of this teacher is shown in Figure 4.16. The students have a different perception of the classroom interpersonal behaviour to that of their teacher. They perceive their teacher's behaviour in the Influence dimension (Dominance-Submission) to be lower in the Submission sectors. The students perceive the teacher to exhibit less of the negative uncertain and dissatisfied behaviours than does the teacher.

Teacher 4
(Ideal Perception)
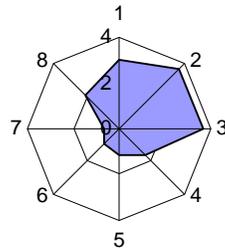
Teacher 4
(Actual Perception)
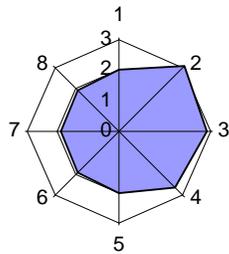
Teacher 4
(Student Perception)
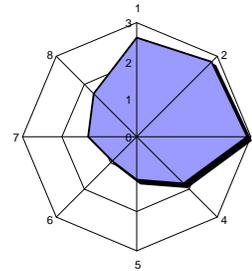
Figure 4.16. Sector profile of Teacher 4.
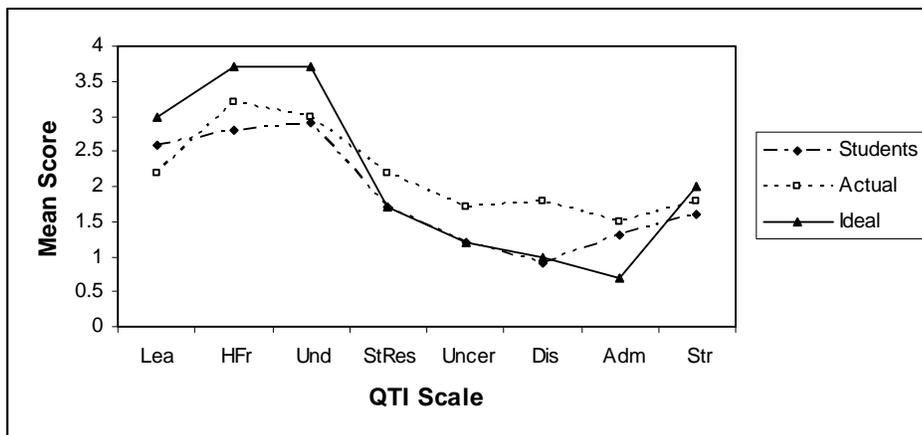
Figure 4.17. Graph of Teacher 4 (Middle stream Year 10 mathematics class).

In reference to Figure 4.17, the students in this classroom also perceive the teacher in a more favourable light than the teacher's own perception. The students deem the teacher to demonstrate more positive helpful/friendly and understanding behaviour and less uncertain, dissatisfied and admonishing behaviour than perceived by the teacher.

The following graphs show the perceptions of a middle stream Year 10 and 9 mathematics class and a heterogeneous Year 8 mathematics class.
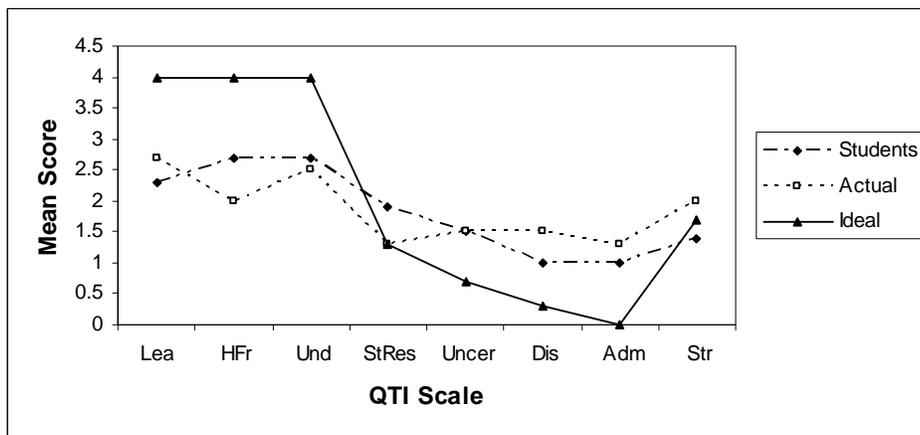
Figure 4.18. Graph of Teacher 5 (Middle stream Year 10 mathematics class).
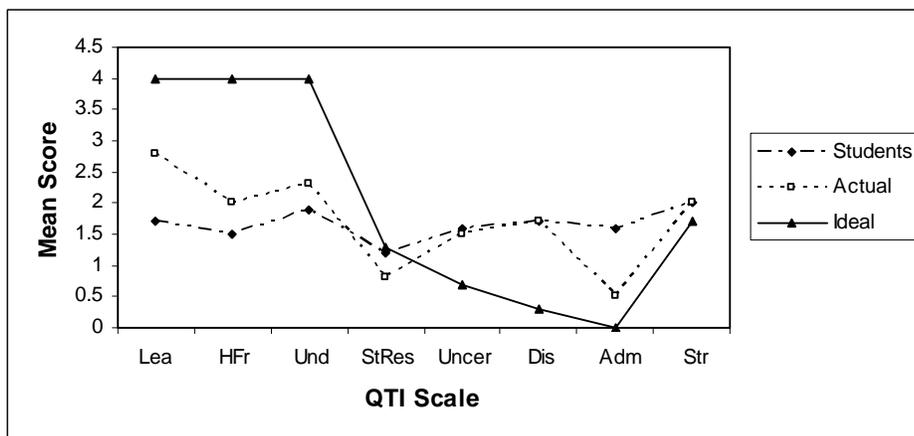
Figure 4.19. Graph of Teacher 5 (Middle stream Year 9 mathematics class).
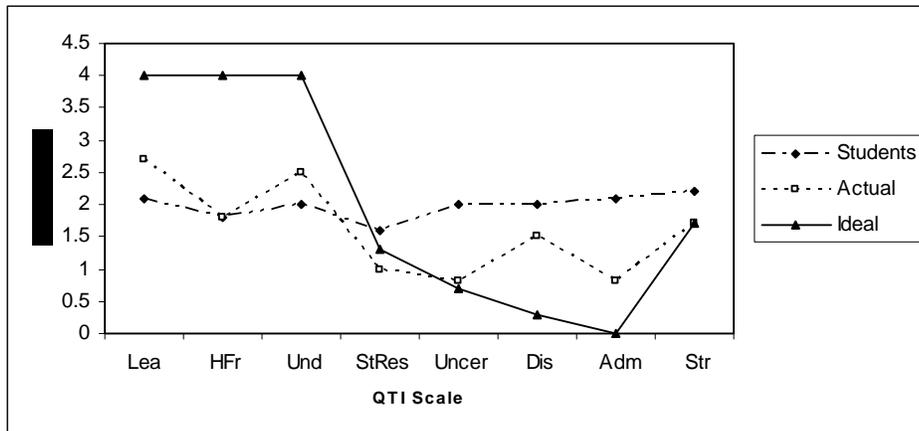
Figure 4.20. Graph of Teacher 5 (Heterogeneous Year 8 mathematics class).

In most behaviours, the ideal teacher perception is very different from the actual teacher perceptions and the students' perceptions of this teachers classroom behaviour. This pattern is repeated in all three classes. The ideal teacher would exhibit greater leadership, helpful/friendly and understanding behaviour than he and his students perceive he demonstrates.

**Teacher 5
(Ideal Perception)**
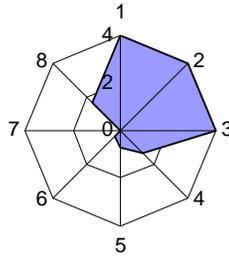
**Teacher 5
(Actual Perception)**
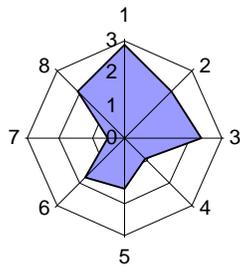
**Teacher 5
(Student Perception)**
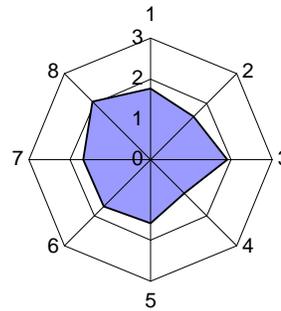
Figure 4.21. Sector profile of Teacher 5 (Year 9 class).

The sector profile of Teacher 5 is shown in Figure 4.21. The students' perception of their teacher's behaviour in the Proximity Dimension (Cooperation-Opposition) is much stronger in the Opposition sectors than his ideal perception.
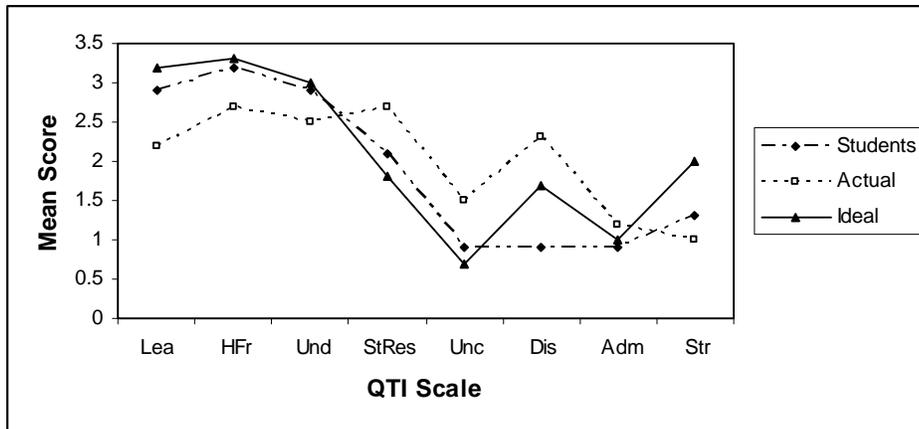
Figure 4.22. Graph of Teacher 6 (Heterogeneous Year 10 science class).
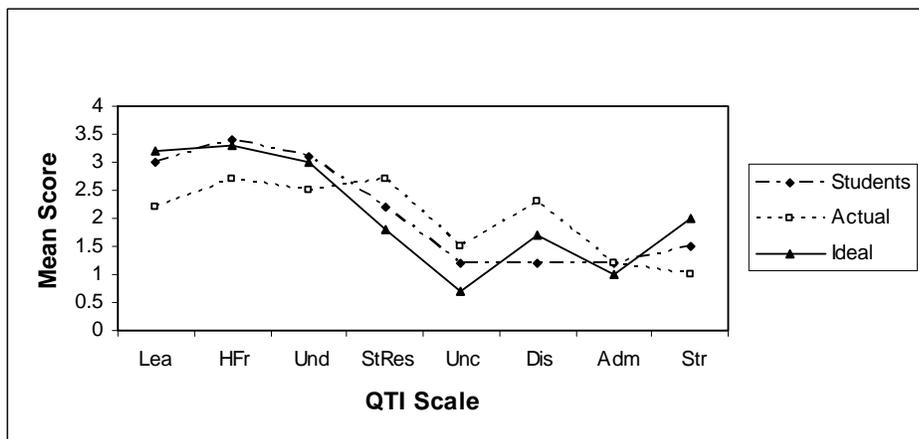
Figure 4.23. Graph of Teacher 6 (Heterogeneous Year 10 science class).

In reference to Figures 4.22 and 4.23, the students from both classes of Teacher 6 perceive the teacher in a more favourable light than the teacher perceives himself. In both classes, the students consider that the teacher shows greater leadership, helpful/friendly and understanding behaviours than the teacher believes and this is close to his ideal. In both classes the students perceive the teacher to exhibit less of the negative uncertain and dissatisfied behaviours than the teacher's perception. The perceptions of the students from both of the teacher classes show a very similar pattern where the teacher's positive behaviours of leadership, helpful/friendly and understanding behaviours are more strongly represented than negative behaviours of uncertain, dissatisfied and admonishing behaviours.
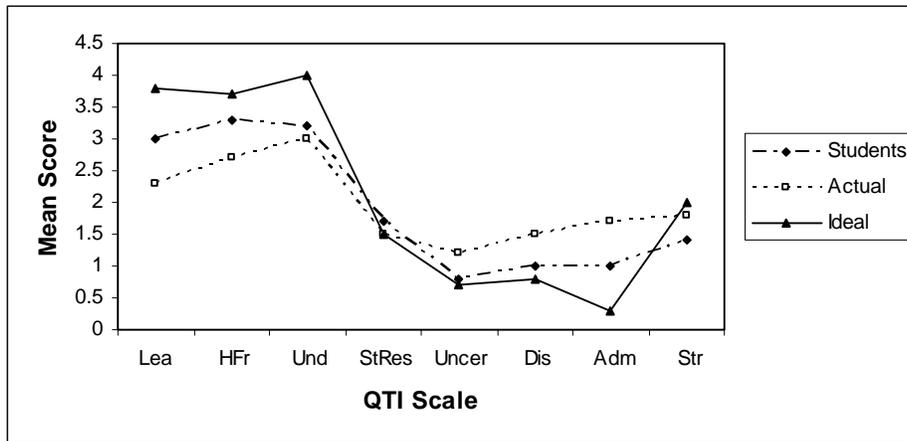
Figure 4.24. Graph of Teacher 7 (Lower stream Year 10 mathematics class).

Figure 4.24 has been included in the results, even though the teacher did not feel that it was a reliable source of data. The sample contained 11 students and was deemed to provide reliable feedback to the teacher (Brekelmans, 1989), but the teacher considered that some students had copied each others answers and that the students who were away when the survey was conducted could significantly affect the results.
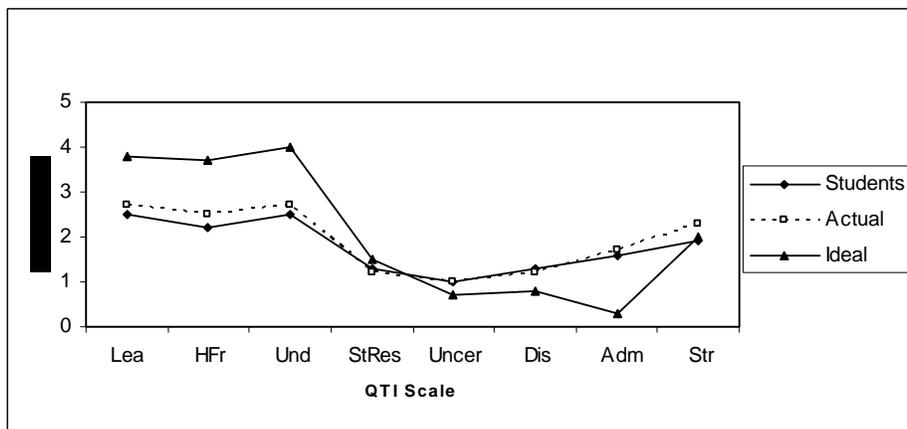
Figure 4.25. Graph of Teacher 7 (Middle stream Year 9 mathematics class).

In reference to Figure 4.25, the teacher's perception of herself matches fairly closely to the students' perceptions of the classroom environment. The teacher's actual perception of the positive behaviours of leadership, helpful/friendly and understanding is much lower than her ideal perception but her actual perception of the negative behaviour of admonishing is much higher than their ideal perception.
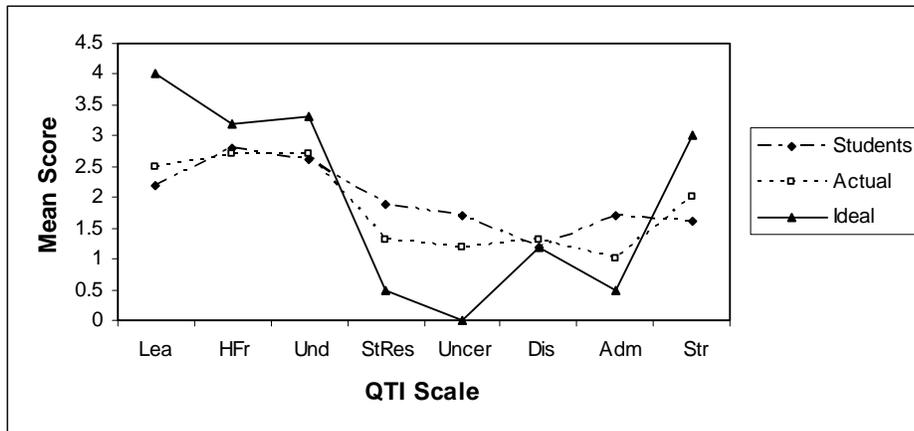
Figure 4.26. Graph of Teacher 8 (Middle stream Year 10 mathematics class).
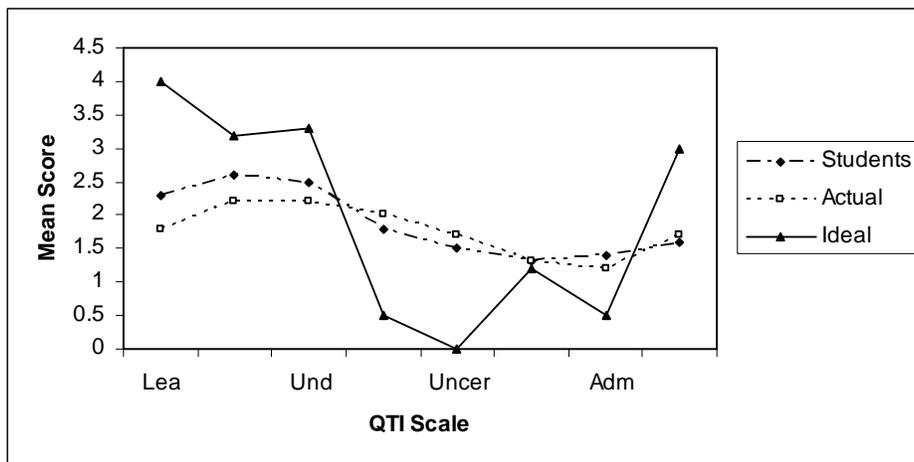
Figure 4.27. Graph of Teacher 8 (Heterogeneous Year 8 mathematics class).

As shown in Figure 4.27, this teacher's actual perception and his students' perceptions are very closely matched. Except for admonishing behaviour, the teacher considers his actual behaviour to be weaker for the positive behaviours and stronger for the negative behaviours.

Teacher 8's other class exhibits a very similar pattern (see Figure 4.26) to the Year 10 class. This teacher's ideal would have much more strict behaviour than they exhibit.
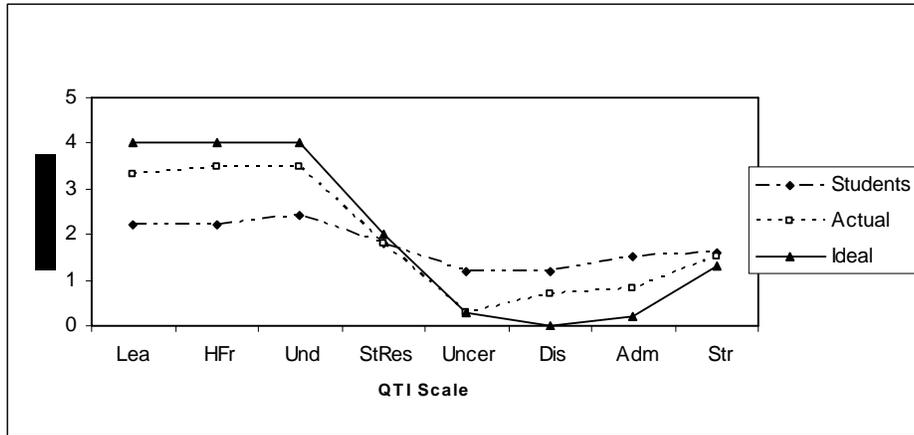
Figure 4.28. Graph of Teacher 9 (Middle stream Year 10 mathematics class).

In reference to Figure 4.28, the profiles for Teacher 9 suggest that the students have a different perception of the classroom interpersonal behaviour than that of their teacher. They perceive less helpful/friendly, understanding or leadership behaviour. The profiles would also suggest that this teacher's ideal teacher would exhibit greater leadership, helpful/friendly and understanding behaviour and less dissatisfied and admonishing behaviour.
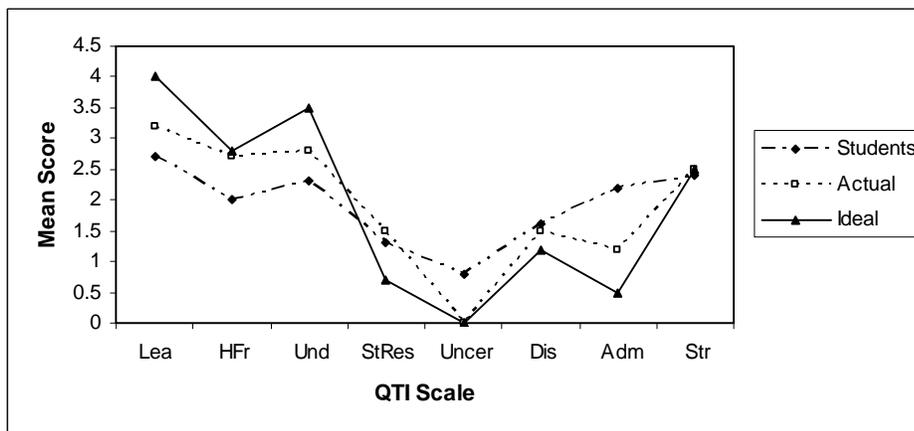
Figure 4.29. Graph of Teacher 10 (Upper stream Year 9 mathematics class).

The profiles for Teacher 10 from his Year 9 mathematics class (see Figure 4.29) show that his actual, ideal and the students' perception of his strict behaviour are similar. Overall though, the students have a different perception of the teacher's classroom interpersonal behaviour. They perceive that the teacher exhibits less

leadership, helpful/friendly and understanding behaviours and more uncertain and admonishing behaviour.
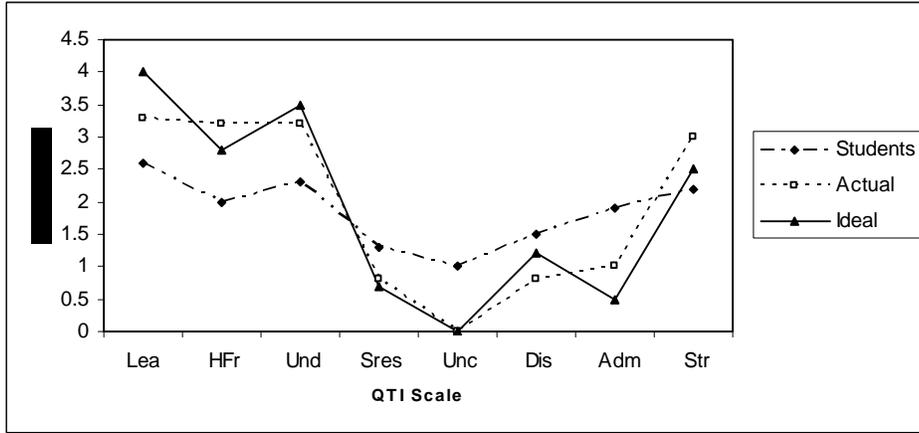
Figure 4.30. Graph of Teacher 10 (Heterogeneous Year 8 mathematics class).

Similar profiles can be observed of his Year 8 mathematics class (see Figure 4.30).
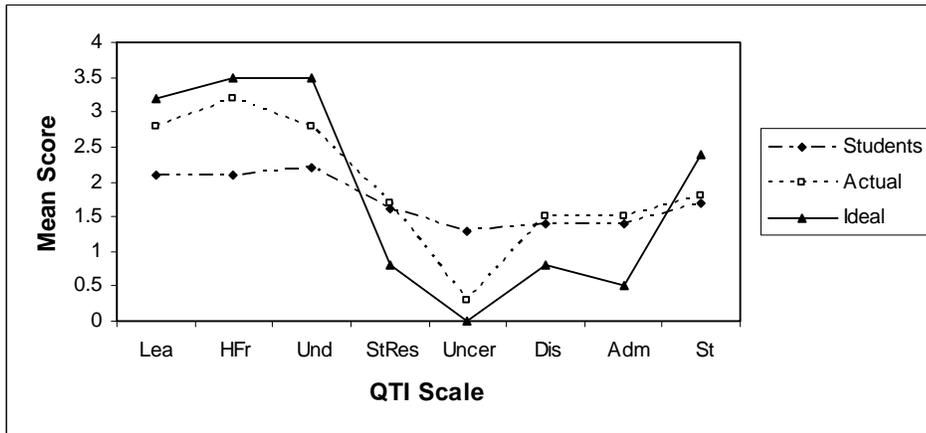
Figure 4.31. Graph of Teacher 11 (Heterogeneous Year 10 science class).

In reference to Figure 4.31, Teacher 11's perception of his dissatisfied, Admonishing and strict behaviour are very similar to his students' perception. The students perceive less leadership, helpful/friendly and understanding behaviours are demonstrated by their teacher. The teacher's actual profile for these behaviours lies closer to their ideal than what is perceived by the students.
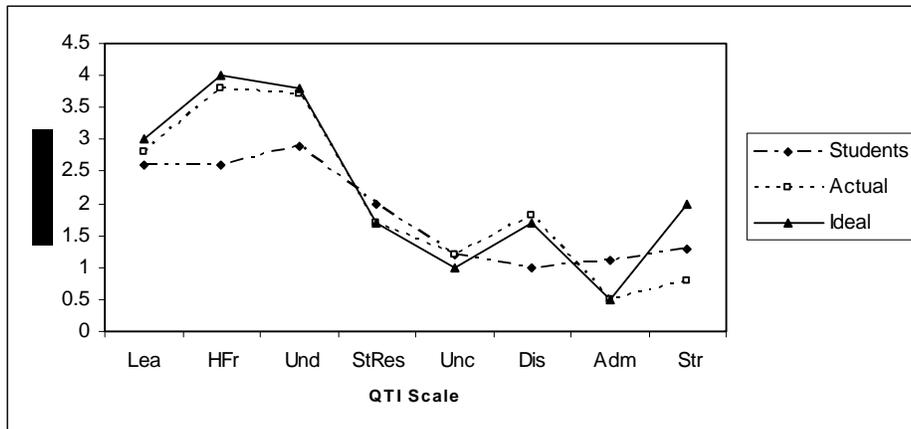
Figure 4.32. Graph of Teacher 12 (Heterogeneous Year 8 Science class).

As shown in Figure 4.32, the teacher profiles for his ideal and actual behaviours are very similar, except for strict behaviour. The students perceive less helpful/friendly behaviours and more admonishing behaviour.

As seen from the findings of this survey, there appears to be a close similarity between all the graphs presented for a particular teacher. This relationship appears to be closer than any links between streamed or non-streamed classes. In this unique sample, where some of the participants teach both streamed and non-streamed classes, it appears that the teacher has more influence in determining the nature of the classroom learning environment than whether the students are in streamed or non-streamed classes.

4.6   Summary

This chapter has given a detailed account of the quantitative and qualitative results that were collected during this study. The results obtained from using the QTI as the instrument for collection of the quantitative data, have shown internal reliability and consistency comparable with previous research (Rickards & Fisher, 1996). Validation of these results has occurred due to consistent supporting comments from students and observations of the classrooms. The profiles for the mean scores of the QTI for the whole school show similarities with previous studies (Wubbels, 1993), but large variations occur with individual teacher profiles. The next chapter will discuss the implications of these results.

CHAPTER 5

DISCUSSION

5.1 Introduction

The previous chapter presented the results that were obtained from this study. This chapter discusses the data obtained and relates results to findings from previous studies and the research questions for this study. The discussion first looks at the validity of the data. The discussion then examines the differences between the teacher's actual perception and the students' perceptions of the classroom learning environment. This discussion was grouped into upper stream, middle stream, lower stream and heterogeneous classes to see if there were any common links between these student groupings.

Finally, a discussion on how the information collected from the teacher actual and teacher ideal perceptions, and the students' perceptions has been used by the teachers to reflect on and consider making changes to their teaching practice is given. A study conducted by Woods and Fraser (1995), showed that the teachers who received feedback, compared with teachers who did not receive feedback, were able to achieve more reductions in actual-preferred discrepancies on most classroom dimensions. This comparison between teacher and student perceptions of their classrooms served as a starting point to enable teachers to make possible changes to improve the classroom learning environment. This process of feedback during the study that was applied to classrooms post quantitative data collection, is a unique feature of this study.

5.2   General Discussion Including Comments on Validity and Reliability

In reference to Research Question 1, the validity and reliability of the QTI for this unique sample was determined. Ascertaining whether the teachers accepted the students' perceptions of their classroom learning environments as valid and meaningful was necessary in order to address the research questions. The students' perceptions and the teachers' actual and ideal perceptions were then used as a catalyst for encouraging teachers to make changes to improve their classroom

environments. The study was a teaching tool available for the teachers' use, which could then be used to improve the learning outcomes of their students.

A participating teacher was very surprised at the students' perception of his teacher-student interpersonal behaviour for the Uncertain behaviour scale and then questioned the validity of the QTI. He considered that in his opinion, if the students' perception of the Uncertain scale was so far from his perception, then all results would have to be questioned. The comments below are from an interview conducted with this teacher. The *'thing'* referred to during the interview is the students' perception of the teacher's Uncertain behaviour as represented on line graphs for his two classes profiles.

> *Teacher 10: The main problem is as perceived by the students is my Uncertainty and I don't understand that.*

> *Researcher: There is no way you're uncertain of what you are doing in the classroom. Do I check the data again?*

> *Teacher 10: It's come up twice so it's not the data.*

> *Researcher: Did you look back at the questions?*

> *Teacher10: You gave me the questions and I still can not believe that that is correct.*

> *Researcher: It doesn't agree with my observations in your classroom.*

> *Teacher 10: I do not believe I display uncertain behaviour.*

> *Researcher: So does that in your eyes put the whole thing as null and void and useless.*

Teacher 10: Yeah, well it does because this thing here I really don't agree. So if I don't agree with one thing then it must question the rest of the stuff, validity of the rest of the stuff.

Teacher 10: I can understand the differences in everything else bar just that one thing.

Researcher: You have top students so they don't 'not understand the questions'. So that's not going to be an issue.

Teacher 10: Can you find some students who have said 'Yes, the teacher is Uncertain'- I believe he is Uncertain and go back and interview them.

Following this interview with Teacher 10, the data were first verified for accuracy by checking the data entry for a second time. Closer examination of the student results of the questions relating to the Uncertain behaviour was conducted. Question 23, *'It is easy to make a fool out of this teacher'* appeared to be one of the main reasons for the higher than expected result for this negative scale of behaviour. A sample of students who scored a higher value for this question was selected to be interviewed. A selection of comments from these students is given below.

Student 1: Some of the boys were always picking on him and joking but the teacher picked on them.

Student 2: It's easy to make a fool of him. Yes, because he reacts to whatever you do. Just reacted to me and my friends.

Students 3 & 4: Always in control. Never unsure of what he did. Always knew what he was talking about.

From the discussions with these students, it appears that the reason for the higher scores on this particular question could be related to the teacher's interaction with a particular group of boys in the class. The humorous interchanges and banter between this group of boys and the teacher may have been the reason for the results to this

question. Out of the six questions relating to Uncertain behaviour, Question 23 *'It is easy to make a fool out of this teacher'* scored 45 for the class results. This was much higher than the other questions where scores of 28, 21, 13, 21 and 21 were recorded. Feedback from this information was given to the teacher. The teacher then felt he could understand the reason for the student responses to that particular question and accept the results of the study. It was also noted that the Uncertain scale scores for both his classes were lower than that for most other participating teachers. The results of this survey showed internal reliability and consistency comparable with previous research (Rickards & Fisher, 1996) and this information was discussed with the teacher.

5.3 Teacher's Actual and Students' Perceptions of Streamed Classes

5.3.1 Upper Stream Classes

The average teachers' perceptions of their behaviour take a position between the students' perceptions of actual behaviour and the teachers' ideal (Wubbels, 1993). Usually, teachers think that they behave closer to their ideal than the students believe i.e. they consider their learning environment in a more favourable light than seen by their students (Wubbels, 1993).

Teacher 1's perception of her Year 9 upper stream mathematics class was a reasonably close match to the students' perception of her classroom behaviour. The teacher said she enjoyed teaching this class and this is verified by the close match for Dissatisfied behaviour. The students' perception and the teacher's actual perception of this behaviour were low (Figure 4.3, p.40). Her ideal was to have a lower value for this sector. The teacher perceives herself to be stricter than her ideal or the students' perception of this behaviour but all three perceptions are high for this behaviour. Even though the students perceive the classroom to be controlled, they appear to be happy in this environment as their learning is not interrupted.

The profile of Teacher 3 for his upper stream Year 10 science class shows that he perceives himself to be showing more Leadership, Helpful/Friendly and

Understanding behaviour than the students' perception of his behaviour. The students in this class had commented that he continued to teach even when they were not paying attention and that he got angry quickly. The behaviour exhibited by this teacher may be considered to be the 'tea-kettle effect' (Wubbels & Levy, 1993). The disorder in the classroom escalated to where confrontation could not be avoided.

The cohort for the upper stream Year 10 mathematics class taught by Teacher 1 was very similar to the above class. Although the students' perception of Leadership, Helpful/Friendly and Understanding behaviour is lower than the teacher's perception, the comparison between student and teacher perceptions of Leadership and Helpful/Friendly behaviours is more similar for Teacher 1 than Teacher 3. Comments from informal student interviews supports the quantitative data where the students commented that it was more friendly in Teacher 1's classroom and there was more interaction with the teacher.

5.3.2 Middle Stream Classes

The teacher's actual perception and the students' perception of Teacher 7's middle stream Year 9 mathematics class are very similar (Figure 4.25, p.57). A very different situation has occurred in Teacher 9's middle stream Year 10 mathematics class, where there is a wide gap between the teacher's actual and the students' perception of the classroom learning environment (Figure 4.28, p.59). This teacher perceives themselves to be much higher in Leadership, Help/Friendly and Understanding behaviours and lower in Dissatisfied and Admonishing behaviours than their students' perception. Another contrast is shown where the students of Teacher 4's middle stream Year 10 mathematics class, perceive the teacher to show higher Leadership behaviour and lower Uncertain and Dissatisfied behaviour than his own perception (Figure 4.17, p.52).

5.3.3 Lower Stream Classes

Interpersonal teacher behaviour is an important aspect of the learning environment (Wubbels, 1993). To foster student outcomes, high scores in Leadership, Helpful/Friendly and Understanding sectors and low scores in the Uncertain,

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Dissatisfied and Admonishing sectors are needed. From previous studies conducted in the Netherlands, America and Australia, the best teachers according to students are those who show the above characteristics. Teacher 2's profile shows the reverse of the characteristics deemed needed for a good teacher (Figure 4.7, p.44). Using triangulation to validate the data, shows consistency between information obtained from the QTI profiles, student's comments and classroom observations.

Teacher 2's lower stream Year 9 mathematics classroom appears to be dysfunctional where some students are prepared to 'wag' class and face the consequences rather than be in the classroom. Most students in the classroom preferred to receive help from the support teacher and often made comments such as 'we don't want your help, we want "our support teacher"' when communicating with the teacher. Negative comments directly about the teacher or about being in the class were a regular daily event. The role of the support teacher became very difficult, because to meet the students learning needs, a huge input into their emotional well being was necessary. This required the support teacher to have the ability to diffuse potentially difficult situations, without undermining the teacher's authority. The support teacher offered advice to improve the student's learning outcomes by suggesting encouraging the students and varying his method of delivery of new material.

The students' perception of Teacher 4's behaviour in the other lower stream Year 9 mathematics class was a marked contrast from Teacher 2. Teacher 4 profiles (Figure 4.15, p.51), tended to underestimate some of his good teaching behaviours when compared with his students' perceptions. This classroom appears to be a functional classroom in which the students perceive their teacher to be helpful and friendly and exhibiting high leadership characteristics. The data appears to be contrary to studies showing that lower stream groups often receive a lower quality of instruction than other groups (Hollifield, 1987). From the data collected, it appears that there is little correlation between these two lower stream mathematics classes, and that the teacher may play a more pivotal role in determining the more desirable classroom environment.

5.4 Actual Teacher and Students' Perceptions of Non-Streamed Classes

The profiles of Teacher 1 (Figure 4.5, p.42) for her Year 8 mathematics class suggests that the students perceive the teacher to have slightly less Leadership, Helpful/Friendly and Understanding behaviours and slightly more Uncertain, Dissatisfied, Admonishing and strict behaviours. Even though the difference is not great between student and teacher's actual perceptions of the classroom learning environment, the teacher does perceive herself in a more favourable light than the students. Her actual perceptions of the classroom lie closer to her ideal perceptions, than that of her students.

This same Year 8 group is taught by Teacher 3 for science and the profiles for this class show a marked contrast with the profiles for Teacher 1. The profiles for this class (Figure 4.12, p.48) show a large difference between the teacher's actual perception and the students' perceptions of the learning environment. The students perceive less Leadership, Helpful/Friendly and Understanding behaviours and more Uncertain, Dissatisfied and Admonishing behaviours. Students from this class commented that they 'don't get on with the teacher' and the teacher gets angry in class. Using triangulation to validate the data, shows consistency between information obtained from the QTI profiles, student's comments. This is a unique situation where data has been collected from the same group of students in their mathematics and science classes. The students' perceptions of the two different classrooms is very different, so it appears that either the subject or the teacher may play an important part in determining the classroom learning environment.

5.5 Feedback and Reflection on Their Ideal and Students' Perception of Classroom Environment

Teachers were debriefed when the data had been collated, and the information was presented in the form of line graphs as illustrated in the Results section. The teachers were then able to see how they saw themselves in relation to their ideal and the way in which the students saw them, in each of their classroom learning environments.

The perceptions of the classroom learning environment in the upper stream Year 9 mathematics class taught by Teacher 1, showed very little gap between their own and the students' perception of the teacher. This teacher considered that a good learning environment had been achieved for this particular class and the QTI data have appeared to confirm the teacher's perception of this classroom.

Teacher 1 often sought feedback in relation to the pace of the delivery of new material as the other upper stream class worked at a slightly faster pace. A UK study showed that approximately one-third of the students taught in highest ability groups were disadvantaged by their placement because of fast-paced lessons and that girls were more affected (Boaler et al., 2000). This problem was overcome by the teacher frequently seeking student input. The student who appeared to feel most pressured in this group was a male student who said 'I'm the dumbest in this class'. The teacher spent a lot of time assisting this student and encouraging him.

This classroom appears to functioning well and this is shown by learning outcomes that have been achieved by these students. The students have performed well in the *Monitoring Standards in Education (MSE)* numeracy test. When compared with the previous years upper stream Year 9 classes, a 16% increase in the number of students reaching the Achievement Target occurred.

In contrast with Teacher 1, there is a large gap between Teacher 2's perception of their lower stream Year 9 class and the students' perception of them. This large gap also occurred in their heterogeneous Year 8 class. From an interactional viewpoint, Teacher 2 appears to fit with the *self-fulfilling prophecy* phenomenon. It is behaviour that brings about in others the reaction to which the behaviour would be an appropriate reaction (Watzlawick, Beavin, & Jackson, 1967). The teacher concerned conceives that he is only reacting to, but not provoking those attitudes. This teacher always blamed the students for the problems that occurred within the classroom and never appeared to reflect on his own behaviour with the aim of improving the classroom situation. After receiving feedback from the questionnaire, Teacher 2 did comment than he was not feeling well and if he had more energy and enthusiasm improvement may have occurred in the classroom environment. The students had requested more teacher directed learning, but he chose to continue with worksheets

as the easy option. Teacher 2 did comment that disciplining would be improved if conducted in a quieter manner and less public situation.

A study conducted at a high school in southern California revealed that teachers who blamed students for failing tests and other assignments, also tended to believe that most of their students did not want to succeed academically (Thompson, Warren & Carter, 2004). Teacher 2 considered that the majority of students in his Year 9 class did not want to be at school, regardless of the teacher, and that they were not interested in achieving good results. The heterogeneous and low stream classes of Teacher 2 show the same pattern, where negative behaviours are higher than the positive behaviours required for a conducive learning environment, so it appears that the teacher may have played the greater role in determining the classroom environment. The teacher perceived that he disciplined both classes in the same way. Teacher 2 felt that the QTI was a worthwhile indication and good guide but still considered that the results were dictated by 'student feelings'.

Teacher 5 considered the study of great value and felt that there should be more opportunities where feedback and information can be made available for use by the teacher. He had been aware of the need for changes to occur to improve the learning outcomes of his students. He had begun by giving his middle stream Year 10 class students more responsibility by allowing them to work in groups of their choice. He was pleased to see that this strategy appeared to have been a positive step in the right direction as seen from his profiles. The students perceive him to be higher in Helpful/Friendly and Understanding behaviours than in his other two classes. These behaviours were closer to his ideal. Teacher 5 was surprised to see that the students' perceive him to demonstrate much greater Admonishing behaviour in his Year 8 and Year 9 classes than he perceives himself to have. From observations, although this teacher rarely appears to get angry, he does forbid, correct and punish often. Comments such as 'Teacher 5 told me off for saying good morning to him' have been told to me as I have walked passed them when they have been removed from their classroom. By working on improving his Helpful/Friendly behaviour, the teacher felt the Admonishing behaviour may automatically decrease and a profile more like his Year 10 class may occur.

Teacher 5 felt that the feedback had given him an overall understanding of his behaviours through his students' eyes. He was concerned about the difference between his students' perception and his own and was intending to work on improving his level of Helpful/Friendly and Understanding behaviours in an effort to minimize the gap between his own and the students' perception of them to create a conducive learning environment. The profiles for his Year 8 mixed-ability class and Year 9 middle level class are similar, so it appears that the teacher plays an important part in determining the classroom environment, regardless of student grouping.

The self-perception of the teachers was compared with their ideal perception and the perception of the students. Teachers 1, 2, and 5 follow this normal trend where the teachers believe that they behave closer to their ideal than the students think they do. Teacher 4 has not followed the normal trend of the average teacher and this may be due to the teacher being very conservative in his own self evaluation. The student perceptions of his behaviour appear to lie closer to his ideal perceptions than his actual perceptions in some types of behaviour. These include Leadership, Student Responsibility, Uncertain and Dissatisfied behaviours. The profiles for Teacher 4 suggest his ideal teacher exhibits greater Leadership, Helpful/Friendly and Understanding behaviours and less Uncertain, Dissatisfied and Admonishing behaviours than he perceives he demonstrates. This teacher considers himself to be cautious when evaluating himself and that he will always chose the lower perimeter. His Admonishing behaviour has appeared high in both his middle and lower stream classes. This is one area of behaviour that he knew was a problem, and the results from the survey have confirmed that this is an area where improvements to his teaching practice could be made.

Teacher 4 felt that he treated both his middle and lower stream classes in the same manner and this has been supported by the similarity in profiles from both his classes. He was very careful not to make the students 'feel dumb' in his lower stream class. This is contrary to other studies which have shown that students grouped in lower tracks have lower self-esteem; and that tracking produces no positive results (George, 1996). Teacher 4 considered the study to be worthwhile but was initially hesitant because of the 'unknown'. Teacher 4 felt that receiving

feedback from the surveys was very valuable and that it would be good to continue to use the QTI in the school.

Teacher 7 felt that even though her lower stream Year 10 mathematics class complied with the requirement of the sample consisting of at least 10 students deemed necessary for reliable feedback (Brekelmans, 1989), she decided that more value would be gained from feedback from her middle stream Year 9 class. Teacher 7 considered the most important feedback from the survey was that they perceived the classroom learning environment in a similar light to their students' perception. Teacher 7 was realistic about the students' perception. She agreed that she did express anger and irritation because of student under achievement but would not change this behaviour. The teacher perceived themselves to be stricter than the students. Teacher 7 was more interested in receiving the feedback from the students in her classroom than comparing her actual profile and ideal profile. Teacher 7 considered it unattainable to reach her ideal, given the cliental of the school.

Teacher 9 perceived themselves much more favourably than their students. Their actual perception of their teacher-student interpersonal behaviour was much closer to their ideal. When shown this information, the teacher became very defensive and commented that they 'made no apology for the results as it was due to the type of students in the group'.

All teachers involved in the study were interested to receive feedback about their actual, ideal and the students' perceptions of their teacher-student interpersonal behaviour. As shown above, following discussions and reflection of the information, some teachers were not open to change. In some cases, the data gave verification of what the teacher already considered a problem. The data has then helped to motivate the teachers to change certain behaviours in an attempt to create a more desirable learning environment. Most teachers viewed their students' perceptions of their classrooms as valid and thus providing useful information to make informed changes to their learning environments.

This chapter has discussed the findings from the quantitative and qualitative data relevant to the research questions and related results to findings from previous

studies. Discussions with teachers on feedback of their results from the study were included.

The next chapter will provide a conclusion to the study, relating findings to the research questions, discussing the implications, limitations and possible future research that could be undertaken following this study.

CHAPTER 6
CONCLUSION

6.1 Introduction

The purpose of this study was to use teacher-student perceptions of the classroom environment to provide informed data about the classroom climate. This valuable information then enabled teachers to self-reflect on their teaching performance. The teachers were then able to make possible changes to their behaviour in an attempt to improve their classroom learning environments.

Three versions of the QTI were used and this gave teachers information about their students' perceptions of their interpersonal behaviour, their own perceptions of their interpersonal behaviour and what they considered to be ideal interpersonal behaviour. Triangulation of the data occurred by collecting qualitative data from a sub-set of the sample. The processes used relied on defining the classroom environment using the shared perceptions of the teacher and students. Both teachers and students felt comfortable having me in the role of Primary Researcher. Some of the teachers are used to me being part of the classroom environment in my role as Numeracy Support teacher. Minimum disruption occurred in the classes and both teachers and students trusted me in my role as researcher.

This chapter provides a summary of the significance of the study, a discussion of the limitations of the study, possible areas for future research and some concluding remarks.

6.2 Significance of the Study

Research Question 1.

Is the Questionnaire on Teacher Interaction (QTI) *a valid and reliable instrument for this unique sample.*

The QTI has been shown to be valid and reliable when used with this sample. The QTI has been previously validated in a variety of situations (Fisher et al., 1996) and

has shown the same characteristics as found in this study. Qualitative data in the form of classroom observations and informal interviews helped to support and validate the quantitative data.

Research Question 2.

To determine if the teacher's actual perception of their classroom environment differ from the student perceptions of secondary upper, middle and lower stream mathematics and science classes?

The results to this question varied according to the individual teacher. In some cases, the teacher's behaviour was perceived in a more favourable light by their students. Some teacher's actual perception of their student-teacher interpersonal behaviour was a close match to their students' perceptions. Most teachers perceived themselves more positively than they were perceived by their students. This follows the normal trend that has been found in previous studies. They tend to see the learning environment a little more favourably than do their students (Wubbels, 1993).

Research Questions 3. & 4.

To determine if information collected from students about their perceptions of classroom environment in upper, middle and lower mathematics and science classes be used by teachers to reflect on and change their teaching practice?
To determine if information collected from teacher actual and teacher ideal perceptions of teacher-student interpersonal behaviour be used by teachers to reflect on and change their teaching practice?

Self-evaluation by teachers is a potentially powerful tool when the teacher attempts to create a more favourable classroom learning environment. Feedback obtained from the students with whom they are interacting provides valuable information as the students can no longer be regarded as passive recipients of learning, but are active constructors of the learning environment (Grundy, 1995). Students are in a good position to make judgements about classrooms because they have experienced many different learning environments and have had enough time in a class to form accurate opinions (Fraser, 2001). If the students perceive the learning environment in a less positive light than the teacher, than based on the collected data, the teacher

was able to make a better decision on how to change their behaviour to make a more desirable learning environment.

The study has been a real world authentic example which has been of value for the participating teachers. The study has had significance for the teachers involved as it has prompted most of these teachers to reflect on their teaching practice and, using the collected data, make changes that are specifically directed towards making their classrooms a more positive environment. But as long as some teachers engage in the "blame game", and refuse to accept some responsibility for the learning environment, the benefits that can ensue from the use of the QTI will be minimal for those teachers. The project has also been useful in pointing out existing positive interpersonal behaviour, thus increasing teacher confidence.

6.3   Limitations of the Study

This research has been restricted to a local situation and cannot be used to give any global perspective. Only one country high school with a population of 710 students was chosen for the study and this constitutes a non-random sample. Therefore, replication in multiple schools with random samples of teachers and students is necessary before generalizations can be made. This school draws many of its students from a low socio-economic area. Being restricted to one school, has allowed for a selection of a more homogeneous sample of class groups, ensuring that more variables were not being introduced to influence results.

Another limitation of this study is that the qualitative data were only collected from a subset of the entire sample. Such a subset could be increased if a larger study was undertaken.

6.4   Future Research

Because of the ease in administering the QTI, this research project could be extended from the Mathematics and Science Departments, to other departments at the school. Other teachers from both within the school and other schools in the District have shown an interest in using the QTI.

One teacher commented that he has always conducted a survey at the end of each year to gather information about how his classes have gone during the year. By using the QTI early during the year, and then again towards the end of the school year, he would be able to reflect on his teaching practice and be guided to make changes in each individual classroom while he is still teaching those classes. Using the information gained from the QTI early in the year would provide a basis for guiding systematic attempts to improve the classroom environment. Administering the test for a second time would then inform the teacher if their behaviour modifications had produced any significant changes in the classroom learning environment.

Because of the uniqueness of the sample, further valuable information has been collected. Because streaming only occurs in the Mathematics Department in Years 9 and 10 and in the Science Department in Year 10, some teachers in this study teach both streamed and non-streamed classes. From the results found in Chapter 4, it appears that the teacher is one of the most important determiners of the classroom learning environment. The students' profiles for a particular teacher appear to be very similar, regardless of the class grouping. Teacher 4 was perceived by his students to show more positive behaviours in both his middle stream Year 10 class and his lower stream Year 9 class, whereas Teacher 2 was perceived by his students to show more negative behaviours in both his lower stream Year 9 class and his non-streamed Year 8 class. It appears that the teachers of the lower stream Year 9 classes may have had a greater influence than the class grouping, in determining the nature of the learning environment.

6.5   Summary and Concluding Remarks

With the enthusiasm and support shown by the Principal and the Head of the Mathematics Department, the QTI will be encouraged to be used again by all the Mathematics staff to fulfil their professional obligations of professional growth. A visiting official involved in the school review asked if the teachers involved in the research project felt 'comfortable' being participants. He was reassured that participants in the project were obliging and keen. He considered that the QTI was a

good tool for use in teachers' personal and professional development and enquired if teachers other than those involved in the study were aware of this instrument. As well as academic achievement, students' reactions to and perceptions of educational experiences are important. The use of the QTI may help teachers to create a more positive classroom climate and encourage a passion for Mathematics among students.

How the teacher behaves in the classroom determines whether students feel comfortable, happy, threatened or motivated (Fraser, 2001). Parents wish to see their children happy, motivated and achieving their potential within the school environment. Having a positive classroom environment is not only a valuable goal of education, but impacts on the students' parents, as they seek the best possible conditions for their children.

After having conducted the research, I now have a reliable way of verifying my 'feelings' about my classroom environments. The importance of the students' perceptions was undervalued by me in the past. All too often as teachers, we get caught up with the day to day running of our classrooms and school activities. The chance to undertake this research has allowed me to take time to reflect on my own classroom practices. Although all my class profiles were similar, the classroom that I considered most difficult to manage had the least positive profile. Practices that appear to be successful in my other classes need to be modified to suit the classes that are less academically inclined. All students need the most positive environment possible to enhance their learning.

Because of the similarity of profiles for each individual teacher for all their classes, the QTI could be used during following years. Even though teachers' classes change each year, teachers have shown a willingness to reuse the QTI. The QTI then becomes a valuable quantitative resource, aiding teachers to monitor the changes that have occurred in their teaching practice. The teachers can then continue their quest for improving their classroom environments, and subsequently student learning.

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Appendix A
Student Questionnaire

This questionnaire asks you to describe the behaviour of your teacher.

This is NOT a test.
Your opinion is what is wanted.

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

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

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

Attitude Questionnaire

Could you please think about the following statements in relation to the class in which you are in right now and complete in a similar manner to the above.

		Never				Always
1.	I look forward to this class.	0	1	2	3	4
2.	I feel confused during this class.	0	1	2	3	4
3.	This class is a waste of time.	0	1	2	3	4
4.	This class is among the most interesting at this school.	0	1	2	3	4
5.	The work is hard in this class.	0	1	2	3	4
6.	The thought of this class makes me tense.	0	1	2	3	4
7.	I enjoy this class.	0	1	2	3	4

Appendix A

My Name _____ Class _____ School _____

Teacher's Name _____

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

Appendix B   (Teacher Actual QTI)

Name_____ Class_____ School_____

Please circle the appropriate response:

	Never			Always	
1. I talk enthusiastically about my subject.	0	1	2	3	4
2. I trust the students.	0	1	2	3	4
3. I seem uncertain.	0	1	2	3	4
4. I get angry unexpectedly.	0	1	2	3	4
5. I explain things clearly.	0	1	2	3	4
6. If students don't agree with me, they can talk about it.	0	1	2	3	4
7. I am hesitant.	0	1	2	3	4
8. I get angry quickly.	0	1	2	3	4
9. I hold the students' attention.	0	1	2	3	4
10. I am willing to explain things again.	0	1	2	3	4
11. I act as if I do not know what to do.	0	1	2	3	4
12. I am too quick to correct students when they break a rule.	0	1	2	3	4
13. I know everything that goes on in the classroom.	0	1	2	3	4
14. If students have something to say, I will listen.	0	1	2	3	4
15. I let students boss me around.	0	1	2	3	4
16. I am impatient.	0	1	2	3	4
17. I am a good leader.	0	1	2	3	4
18. I realise when students don't understand.	0	1	2	3	4
19. I am not sure what to do when students fool around.	0	1	2	3	4
20. It is easy for students to pick a fight with me.	0	1	2	3	4
21. I act confidently.	0	1	2	3	4
22. I am patient.	0	1	2	3	4
23. It's easy to make a fool out of me.	0	1	2	3	4
24. I am sarcastic.	0	1	2	3	4
25. I help students with their work.	0	1	2	3	4
26. Students can decide some things in my class.	0	1	2	3	4
27. I think that students cheat.	0	1	2	3	4
28. I am strict.	0	1	2	3	4
29. I am friendly.	0	1	2	3	4
30. Students can influence me.	0	1	2	3	4
31. I think that students don't know anything.	0	1	2	3	4
32. Students have to be silent in my class.	0	1	2	3	4
33. I am someone students can depend on.	0	1	2	3	4
34. I let students fool around in class.	0	1	2	3	4
35. I put students down.	0	1	2	3	4
36. My tests are hard.	0	1	2	3	4
37. I have a sense of humour.	0	1	2	3	4
38. I let students get away with a lot in class.	0	1	2	3	4
39. I think that students can't do things well.	0	1	2	3	4
40. My standards are very high.	0	1	2	3	4
41. I can take a joke.	0	1	2	3	4
42. I give students a lot of free time in class.	0	1	2	3	4
43. I seem dissatisfied.	0	1	2	3	4
44. I am severe when marking papers.	0	1	2	3	4
45. My class is pleasant.	0	1	2	3	4
46. I am lenient.	0	1	2	3	4
47. I am suspicious.	0	1	2	3	4
48. Students are afraid of me.	0	1	2	3	4

Appendix C   (Teacher Ideal QTI)

Name_____ Class_____ School_____
Please circle the appropriate response: Gender: male   female
Years of teaching: 1--5   6--10   > 10   Never   Always

1.	The teacher would talk enthusiastically about her/his subject.	0	1	2	3	4
2.	The teacher would trust students.	0	1	2	3	4
3.	The teacher would seem uncertain.	0	1	2	3	4
4.	The teacher would get angry unexpectedly.	0	1	2	3	4
5.	The teacher would explains things clearly.	0	1	2	3	4
6.	If students did not agree with the teacher, they could talk about it.	0	1	2	3	4
7.	The teacher would be hesitant.	0	1	2	3	4
8.	The teacher would get angry quickly.	0	1	2	3	4
9.	The teacher would hold the students' attention.	0	1	2	3	4
10.	The teacher would be willing to explain things again.	0	1	2	3	4
11.	The teacher would act as if she/he did not know what to do.	0	1	2	3	4
12.	The teacher would be too quick to correct students when they broke a rule.	0	1	2	3	4
13.	The teacher would know everything that goes on in the classroom.	0	1	2	3	4
14.	If students had something to say, the teacher would listen.	0	1	2	3	4
15.	The teacher would let students boss her/him around.	0	1	2	3	4
16.	The teacher would be impatient.	0	1	2	3	4
17.	The teacher would be a good leader.	0	1	2	3	4
18.	The teacher would realise when students did not understand.	0	1	2	3	4
19.	The teacher would not be sure what to do when students fooled around.	0	1	2	3	4
20.	It would be easy to pick a fight with the teacher.	0	1	2	3	4
21.	The teacher would act confidently.	0	1	2	3	4
22.	The teacher would be patient.	0	1	2	3	4
23.	It would be easy to make a fool out of the teacher.	0	1	2	3	4
24.	The teacher would be sarcastic.	0	1	2	3	4
25.	The teacher would help students with their work.	0	1	2	3	4
26.	Students could decide some things in the teacher's class.	0	1	2	3	4
27.	The teacher would think that students cheat.	0	1	2	3	4
28.	The teacher would be strict.	0	1	2	3	4
29.	The teacher would be friendly.	0	1	2	3	4
30.	Students could influence the teacher.	0	1	2	3	4
31.	The teacher would think that students did not know anything.	0	1	2	3	4
32.	Students would have to be silent in the teacher 's class.	0	1	2	3	4
33.	The teacher would be someone students can depend on.	0	1	2	3	4
34.	The teacher would let students fool around in class.	0	1	2	3	4
35.	The teacher would put students down.	0	1	2	3	4
36.	The teacher's tests would be hard.	0	1	2	3	4
37.	The teacher would have a sense of humour.	0	1	2	3	4
38.	The teacher would let students get away with a lot in class.	0	1	2	3	4
39.	The teacher would think that students can't do things well.	0	1	2	3	4
40.	The teacher's standards would be very high.	0	1	2	3	4
41.	The teacher could take a joke.	0	1	2	3	4
42.	The teacher would give students a lot of free time in class.	0	1	2	3	4
43.	The teacher would seem dissatisfied.	0	1	2	3	4
44.	The teacher would be severe when marking papers.	0	1	2	3	4
45.	The teacher 's class would be pleasant.	0	1	2	3	4
46.	The teacher would be lenient.	0	1	2	3	4
47.	The teacher would be suspicious.	0	1	2	3	4
48.	Students would be afraid of the teacher.	0	1	2	3	4

Appendix D

<u>Information Sheet</u>

Statement of the Problem:
As a full time teacher, my opinion has been that the atmosphere or classroom learning environment in a classroom plays an important role on the outcomes achieved by the students. I have always relied on my 'feelings' to judge the classroom climate. The literature in this area of research also suggests that classroom environment so strongly influences student outcomes that it should not be ignored by those wishing to improve the effectiveness of schools (Fraser, 2001). Fisher, Rickards & Fraser (1996), discuss the various forms of the *Questionnaire on Teacher Interaction (QTI)*, and report its use in past research and suggest that the use of questionnaires is one method of obtaining useful information about the learning environment from the students.

Past research has looked at the relationship between student achievement and the quality of the classroom learning environment. The consistent and overwhelming evidence from these studies is that the classroom environment strongly influences student achievement (Fraser, 2001). In my proposed research project, I will be using questionnaires to collect the quantitative data and interviews and classroom observations to collect the qualitative data. The information will be collected from streamed and non-streamed classes.

For this research project, the administering of the QTI requires about 15-20 minutes, so very little valuable class time will be lost. The interviews will involve only a small group of students, and these will be conducted at a time that the teacher deems convenient.

Students, teachers or the school name will not be used in the reporting of the study. They will be coded as numeric values during data preparation and entry. Names will be altered in qualitative data collected for the study.

Because the participants in my study are young students, I will send home a consent form containing information about the project to parents. Parents and students are not unaware of the subjective nature of classroom interactions and the importance of being liked by the teacher (Bournot-Trites & Belanger 2005). The parents will be able to contact me about any concerns that they may wish to discuss at any stage during the project. Two newsletters are mailed to parents each term, so the consent form can be included with one of these newsletters. I will be available for parents to contact me if they have concerns at any stage during the project and reassure them that their child will not be jeopardized in any way, if they do not take part in the research project.

I will be working with colleagues who are temporarily transformed into research subjects. The work of a practitioner researcher takes place on the inside of the political context of work, where the researcher may be in a powerful position in relation to the subjects, caused by the research methodology used (Costley & Gibbs, 2006). An 'ethics of care' should prevail to safeguard my personal and moral relations to these colleagues. It is very important for me not to create a conflict of interest for my students, and keep my roles and responsibilities as researcher and teacher compatible.

By using the QTI (Fisher, Rickards & Fraser 1996), and collecting data through informal interviews and classroom observations, this research will provide feedback for the teachers and students. The processes used will rely on defining the classroom environment using the shared perceptions of the teacher and students. This would then help the teachers involved in the study to fulfil their professional obligations of personal and professional growth.

Contact Details: Helen Hedderwick - NASHS, Albany, 6330
                    Dr Tony Rickards – Curtin University of Technology, GPO Box U1985, Perth, 6845
                    The Secretary, HERC
                    Office of Research and Development
                    PO Box U1987
                    Perth WA 6845

Appendix E

<u>Consent Form</u>

North Albany Senior High School
2006

Dear Parent/Caregiver

No longer is it adequate for teachers to rely mainly on the assessment of academic achievement to give the complete picture of a classroom situation. The consistent evidence from studies shows that the classroom environment strongly influences student achievement. The purpose of this project is to collect information about the classroom environment. This research project, *"Differences in Student Perceptions of Teacher-Student Interpersonal Behaviour in Regional Streamed Secondary Mathematics and Science Classes"*, is being conducted by me through the Curtin University of Technology. The use of questionnaires (to be completed by both the teacher and students), informal interviews and classroom observations will be the methods used to obtain information. No students will be individually named and much of the data collected will consist of whole class material.

There will be minimal disruption to students, as the questionnaire requires between 15 and 20 minutes of class time for the students to complete. The observations and informal interviews will be conducted by me. This will occur during normal lesson time.

With feedback collected from this study, we can be guided to improve our teaching and make our classrooms a more positive environment. This can then lead to an improvement in our students' outcomes.

Please contact either Helen Hedderwick or Sharon Doohan (Principal, NASHS), if you have any questions concerning this project.

If you do not wish for your son/daughter to be part of this project, could you complete the following withdrawal form and return it to your child's mathematics teacher.
I look forward to your support in this project.

Yours sincerely

Helen Hedderwick   (Mathematics Teacher / Numeracy Support Teacher)

Exemption/Parent withdrawal

I have read the information explaining the project and do not want my child participating in the study that is exploring classroom climate and its effect on student learning outcomes. I withdraw my permission for the study.

Child's Name:

Parent/Caregiver:

Parent/Caregiver Signature:

Date: