Science and Mathematics Education Centre

Investigating the Use of Teacher Action Research Based on Students' Perceptions of the Learning Environment to Improve Secondary High School Classrooms

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DECLARATION

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

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

Signature: 

Lisa Marie Bell

July 16 2013

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ABSTRACT

This thesis reports the results of a large-scale research program which sought to investigate how student perceptual data, utilised as part of a targeted professional development activity, could be used to help to guide improvements in secondary high school classrooms and contribute to teacher development and growth. The research program involved the use of a multi-method design and was comprised of two concurrent and interrelated investigations. The first investigation (Part A) developed and validated two instruments, one to assess students' perceptions of the learning environment and another to assess their attitudes and academic self-efficacy beliefs. Quantitative data collected over a three-year period from a sample of 10,345 secondary students (2042 student responses in 2008, 4467 student responses in 2009 and 3836 student responses in 2010) in 684 classes (147 classes in 2008, 298 classes in 2009 and 239 classes in 2010) across 29 Western Australian schools were analysed to determine the validity and reliability of the two instruments. The results demonstrated that both instruments have strong construct validity when used with secondary high school students.

The second investigation (Part B) examined the ways in which teachers used their student feedback to reflect, plan and implement strategies to improve their classroom environments and whether this process was a worthwhile model for teacher professional development. Data collected using the two instruments (to assess students' perceptions of the learning environment, their attitudes and academic self-efficacy beliefs) were analysed in various ways to provide teachers with student feedback that they could use as a basis for reflecting on their teaching practices.

As part of this research program, the study examined pre–post differences (n=6107 matched student responses) to determine whether teachers were able to use these two instruments to guide their improvement efforts. The results showed statistically significant pre–post differences (p<0.05) for six of the 11 learning environment scales and for one of the two scales used to assess student attitudes and academic self-efficacy beliefs. These results suggested that, when teachers reflect on student feedback, they were likely to make changes which students perceived as more favourable.

Student feedback was used, by 45 focus teachers, to guide the development and implementation of strategies to improve the classroom environment and to target issues related to students' attitudes towards learning and academic self-efficacy beliefs, as part of a formal action research process. To investigate the processes used by teachers as they reflected on the data (as part of an action research process), multiple sources of information were gathered, including unstructured and semi-structured interviews, field notes, written reports, summaries, reflective journals and teacher evaluation feedback. The results indicated that the pre–post differences for these 45 focus teachers (who used the feedback as part of a formal action research process) was statistically significantly ($p<0.05$) greater than for those teachers ($n=414$ teachers) who used the student feedback as the basis for reflection-only. These findings highlighted the importance of formalised approaches to teacher development and suggest that focused and systematic teacher development initiatives aimed at improving teacher behaviours are more effective than reflection alone. The qualitative data, collected from focus teachers, provided significant insights into the ways in which teachers made use of student perception data to plan and implement strategies for improvement.

This thesis also reports the efforts of one school that purposefully linked their involvement in the research program to their school improvement initiatives, which sought to improve teaching and learning through targeted teacher professional development. The results showed how school-level data, generated using the two instruments, could be used by the school to gauge the success of their improvement initiatives and to guide future planning. When used in this way, this school demonstrated significant improvement in a number of key areas over the period of research. Qualitative data collected from this school suggested that teacher action research, based on student perception data, may be more effective when implemented as part of a whole-school approach because it encourages reflective and collaborative practices and contributes positively to the school culture.

The research presented in this thesis is significant for a number of reasons. First, it makes available two economical and reliable instruments that can be used by teachers as a source of data upon which they can reflect as part of an action research process. One of these instruments includes two new dimensions to assess students'

perceptions of assessment practices in the classroom, an aspect, which has, hitherto, been overlooked in existing learning environment instruments. Secondly, the findings suggest that teacher action research, using student perceptual measures may be a powerful vehicle for effecting change in secondary high school classrooms. The data generated using these two instruments has the potential to provide teachers with valuable data which can be used to assess classroom learning environments and to help them to decide upon strategies for improvement. Thirdly, when implemented as part of a formalised teacher professional development activity, student feedback contributes to the development of reflective practices, which are considered to be central to good teaching practice. Finally, the research highlights the value in using student perceptual measures at the whole-school level as part of school improvement efforts designed to improve teacher quality and to enhance student outcomes.

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LIST OF ABBREVIATIONS USED IN THIS THESIS

Abbreviation	Meaning
ACARA	Australian Curriculum Assessment and Reporting Authority
AISWA	Association of Independent Schools of Western Australia
AITSL	Australian Institute for Teacher and School Leadership
ANOVA	Analysis of Variance
ASBS	Attitudes and Self-Belief Survey
CES	Classroom Environment Scale
CLES	Constructivist Learning Environment Survey
COLES	Constructivist-Oriented Learning Environment Survey
CUCEI	College and University Classroom Environment Inventory
ICEQ	Individualised Classroom Environment Questionnaire
LEI	Learning Environment Inventory
MANOVA	Multivariate Analysis of Variance
MCI	My Class Inventory
MJSES	Morgan-Jinks Student Efficacy Scale
QTI	Questionnaire on Teacher Interaction
SLEI	Science Laboratory Environment Inventory
TOSRA	Test of Science-Related Attitudes
TROFLEI	Technology-Rich Outcomes-Focused Learning Environment Instrument
WIHIC	What is Happening in this Class?

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

This thesis reports a large-scale research program which investigated the feasibility of using student perceptual measures as the basis for teacher development and classroom improvement. The research had two broad aims, these being: 1) To develop and validate two instruments (one to assess students' perceptions of their classroom learning environments and one to assess students' attitudes towards learning and academic self-efficacy beliefs); and 2) to investigate the ways teachers could use student feedback (collected using the two instruments) to make improvements to the classroom learning environment.

Up until 2008, a small number of schools in Western Australia (two of which were involved in this research program) were engaged in an activity that involved teachers using student feedback to make changes to their classroom environments (Aldridge & Fraser, 2008). The data collected for this earlier study was used to investigate senior secondary learning environments and the ways in which the teachers used the data to help to transform their teaching and classroom practices in ways that were considered to be more outcomes-focused, student-centred and aligned with constructivist pedagogy. This earlier research highlighted the important role that teachers play in creating dynamic and effective learning environments and that student perceptual measures could provide an impetus for teachers to reflect and implement strategies for improvement. It was during my involvement in this study that I saw the potential of using student perception data as part of a formalised teacher development activity. As such, the research reported in this thesis builds on and extends this earlier study.

The present study commenced in 2008, at which time a small number of schools were approached, and their teachers invited to participate in the research program. As part of the research activity, participants used student feedback about their classrooms as the basis for action research. Teachers were given opportunities to reflect on their current teaching practice and to collaborate with other teachers to design and implement strategies for improvement. The efforts of the schools and their teachers in the first year of the study generated interest in a number of other schools and, as a result, the number of schools and teachers increased significantly in 2009 and 2010.

Over the three-year period that the research was conducted, the responses of 10,345 students (2042 student responses in 2008, 4467 student responses in 2009 and 3836 student responses in 2010) in 684 classes (147 classes in 2008, 298 classes in 2009 and 239 classes in 2010) in 29 regional and metropolitan co-educational high schools in Western Australia were collected. A total of 548 teachers (107 teachers in 2008, 247 teachers in 2009 and 194 teachers in 2010) participated in the research program over the three years.

1.2 THE RESEARCH PROBLEM

The issue of teacher quality has been an important focus in recent education policies at the national level in Australia. This focus led to the formation of the Australian Institute of Teaching and School Leadership (AITSL), the organisation responsible for the drafting of the National Professional Standards for Teachers which serves to provide a public statement of what constitutes teacher quality in Australia. This statement describes three domains of teaching (professional knowledge, professional practice and professional engagement) and makes explicit what teachers should know, be able to do and what is expected of effective teachers across their career (AITSL, 2011). These standards support clearly the notion that teachers need to be continuous or lifelong learners who see their own development as fundamental to effective teaching.

It appears self-evident that the aim of teacher professional development is to improve teacher effectiveness and the quality of learning in the classroom. The importance of

teacher effectiveness was highlighted in Hattie's (2009) synthesis of over 800 meta-analyses which found that teachers account for around 30% of the variance in student achievement. His research concluded that, while teachers can and do have a positive effect on student learning, expert teachers make the greatest difference. This suggests that, if the aim of education is to have a powerful effect on student outcomes, there should be a clear focus on improving the quality and effectiveness of teaching. Given the constraints of contemporary schooling, however, accessing meaningful professional development is often difficult. Increasingly, the use of action research has proved to be an attractive option for teacher development because it can occur over a period of time, within a school context and can be driven by the teachers themselves either individually or alongside their colleagues, rather than being delivered by an external organisation outside of class time (Borko, 2004; Guskey, 2000; Little, 1993; Porter, Garet, Desimone & Birman, 2003; Putnam & Borko, 2000). The research presented in this thesis sought to investigate teachers' use of feedback from students, as part of an action-research process, to guide improvements in the classroom learning environments, thus providing teachers with an opportunity for teacher development and growth.

There were three main assumptions underlying this research. First, teachers generally are interested in improving their practice and want to create a classroom learning environment that suits the needs of their students. Second, conscious and purposeful reflection on one's teaching can provide a catalyst for change and guide improvements in the way in which one teaches. Finally, students, as the major stakeholders in the education process, are worth listening to.

The use of student feedback as the basis for teacher action research was a key feature of the research. Students are in a good position to make judgements about classrooms because they have experienced many different learning environments and have spent sufficient time in a class to form accurate opinions. It has been estimated that, by the end of their primary education, students may spend up to 7000 hours in school (Jackson, 1968) and by the end of their secondary education, around 15,000 hours in school (Rutter et al., 1979). Therefore, students' reactions to and

perceptions of their educational experiences may provide teachers with valuable insights into their teaching and the classroom learning environment.

A number of influential studies have established that feedback plays an important factor in the development of effective learning and its effect on student achievement (Black & Wiliam, 1998; Hattie, 1992, 2009; Hattie & Jaeger, 1998; Hattie & Timperley, 2007), however, according to Hattie (2009, p. 173), feedback should also play an important role in teaching practice:

> The mistake I was making was seeing feedback as something *teachers provided to students*—they typically did not, although they made claims that they did it all the time, and most of the feedback they did provide was social and behavioral. It was only when I discovered that feedback was most powerful when it is from the *student to the teacher* that I started to understand it better. When teachers seek, or at least are open to, feedback from students as to what students know, what they understand, where they make errors, when they have misconceptions, when they are not engaged—then teaching and learning can be synchronized and powerful. Feedback to teachers helps make learning visible.

Given this, it appears fitting that student perception data could be used to provide teachers with the types of feedback which would help to inform their practice. Feedback information of this nature provides teachers with significant insights into the classroom learning environment through the eyes of their students and diagnostic evidence that can be used to evaluate their own practices and to guide their improvement efforts. Such efforts could be seen to be transformational if it leads to changes in practices and/or teacher behaviours.

1.3 RESEARCH QUESTIONS

The research program presented in this thesis was characterised by a multi-method approach (described in Chapter 3) that utilised quantitative and qualitative methods to address the two broad aims of the research.

In the first instance, it was necessary to tap into past research to develop a tool that teachers could use to obtain student feedback which they could use as the basis for

reflection. To do this, two instruments were developed, one to gather information from students regarding their perceptions of the classroom learning environment and the other, to assess students' attitudes and academic self-efficacy beliefs within that environment. The first research question was developed to examine whether these two instruments were valid and reliable for use in schools, and asked:

1. Are the two instruments developed to assess students' perceptions of the learning environment, students' attitudes and academic self-efficacy beliefs reliable and valid for use in secondary high schools in Western Australia?

The second research question was designed to examine the extent to which the two instruments, when utilised by teachers as part of an action research process, lead to quantitative improvements in students' perceptions of the classroom learning environment, students' attitudes and academic self-efficacy beliefs. To this end, the second research question was:

2. Are teachers able to make use of student feedback (based on responses to the two instruments) to develop and implement strategies that improve students' perceptions of the classroom learning environment?

It was important to investigate the ways in which teachers utilised the student feedback, based on their perceptions of the classroom learning environment and their attitudes and academic self-efficacy beliefs, to effect change and, to this end, the third research question was:

3. How do teachers use student feedback to guide improvements to the classroom learning environment and to implement strategies which target issues related to students' attitudes and academic self-efficacy beliefs?

As one of the aims of the research program was related to teacher development, it was important to investigate the extent to which teachers felt that the action research activity, which utilised student feedback, contributed to their professional development and growth, to this end, the fourth research question was:

4. Do teachers consider the use of action research, based on student perception data, to be a worthwhile model for teacher professional development?

The fifth research question was developed during the course of the research as a result of the efforts of one participating school. This school purposefully linked the action research activities of its teachers to their school improvement initiatives. To this end, the fifth research question was:

5. In what ways did the 'critical instance' school utilise student perception data for teacher professional development and to support initiatives for school improvement?

1.4 OVERVIEW OF THE TEACHER DEVELOPMENT ACTIVITY

This section provides a general overview of the processes and activities which teacher participants engaged in as part of the research. All of the teachers involved in the research utilised student feedback, based on students' responses to the two instruments (described in Chapter 3), to guide improvements to their classroom learning environments using an action research process. This process involved five steps (Fraser, 2007) of:

1. assessing the learning environment, students' attitudes and academic efficacy beliefs (Section 1.4.1);
2. providing feedback to teachers based on students' responses (Section 1.4.2);
3. reflecting on the feedback from students (Section 1.4.3);
4. implementing an intervention (Section 1.4.4); and
5. re-administering the two instruments at the end of the intervention period to determine whether changes were perceived by the students (Section 1.4.5).

Each step is described more fully below.

1.4.1 Step One: Assessing the Learning Environment

Teachers who volunteered to be involved in the research were asked to nominate one or more classes with which they would like to work. Both of the instruments (one to

assess students' perceptions of the learning environment and one to assess students' attitudes and academic self-efficacy beliefs) were administered, simultaneously, to the students in the class or classes that had been selected by the teacher.

For each item or statement on the surveys, students were asked to indicate how often the practice took place (actual response) and how often they would prefer the practice to take place (preferred response) using a five-point frequency scale that ranged from Almost Always to Almost Never. The directions for administration (used to ensure consistency, are described in Section 3.4.1.1).

1.4.2 Step Two: Providing Feedback

Students' responses to items on the two instruments were used to generate a range of information which was provided to teachers in the form of a teacher feedback package. Each feedback package contained profiles (based on students' responses) that included information related to the means, medians, and standard deviation for each scale and individual items.

The first two profiles in the feedback package (examples of which are provided in Figure 1.1) provided a comparison of the average item means for each scale in the two instruments. The first profile, called the circular profile, compared students' perceptions of the actual learning environment (the environment they are currently experiencing) and their preferred (or ideal) learning environment. The second profile (at the bottom of Figure 1.1), a column graph, reported the average item mean for each of the scales used to assess students' attitudes and academic self-efficacy beliefs.

The package also included a box and whiskers plot, showing the distribution of students' responses, mean, median and range for each scale (see Figure 1.2 for an example).

Finally, for each scale, teachers were provided with two profiles, a box plot showing the range of responses for that scale and the means for individual items within the scale (see Figure 1.3 for an example).

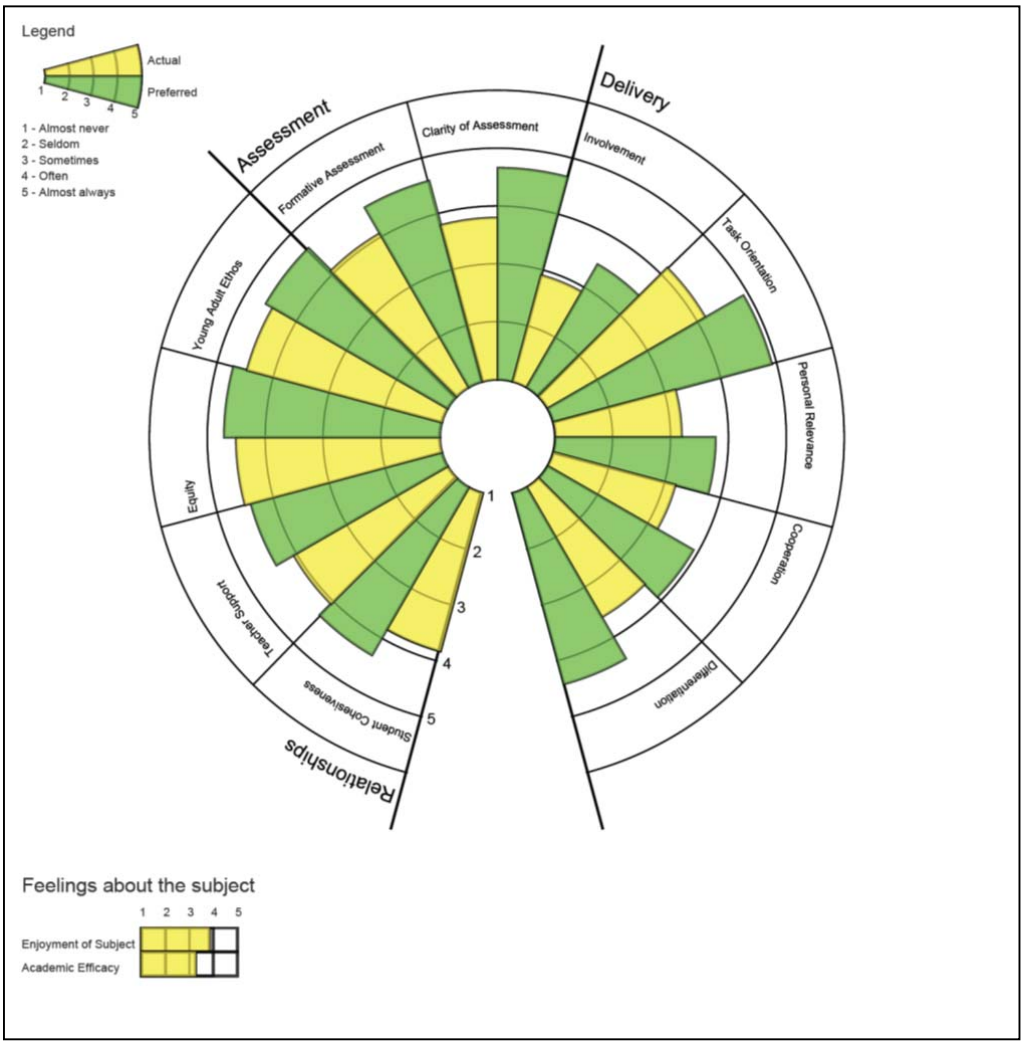


Figure 1.1 Example of a circular profile and column graph used in the teacher feedback package for the pre-test

1.4.3 Step Three: Reflection and Discussion

Step three involved teachers reflecting on the feedback generated from students' responses to the two instruments. Through workshops, small groups or one-on-one sessions, teachers were provided with information about how to interpret the profiles and were asked to use the information to help them to identify an area or areas that they wished to focus upon. They were also given opportunities to discuss, brainstorm ideas and ask questions of the researcher and their colleagues.

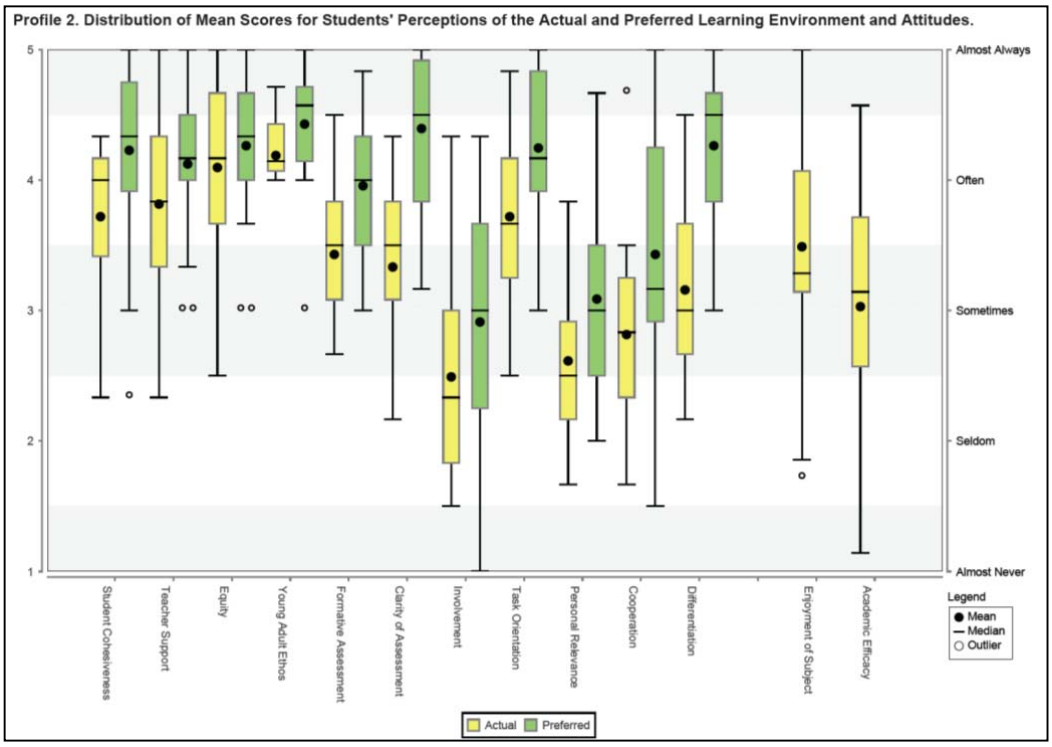


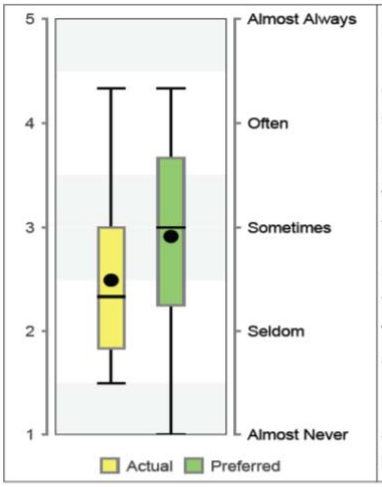
Figure 1.2 Example of the box plots used in the teacher feedback package for the pre-test

Once teachers had decided on the scale or scales that they would focus on, working either individually or collaboratively they devised strategies that they felt would target the areas that they had identified for improvement.

Delivery

Involvement

The **Involvement** scale assesses the extent to which students have attentive interest and participate in discussions in class.



Mean (•): The average item mean for the actual version of the Involvement scale was 2.49 with a standard deviation of 0.79, compared to the preferred average item mean of 2.91 with a standard deviation of 0.83.

Median Value (—): The median value for student responses to the actual version of this scale was 2.33 compared to a median value of 3.00 for students' responses to the preferred version.

Range: In relation to the range of responses for the actual version, the maximum score was 4.33 and the minimum score was 1.50. The maximum score for the preferred version was 4.33 and the minimum score was 1.00.

For the actual version, 50% of students' scores fell between 1.67 and 3.00. For the preferred version, 50% of students' scores fell between 2.17 and 3.67.

Average response for specific items for this scale

Item		1	2	3	4	5
38. I discuss ideas in class.	Actual	2.32				
	Preferred	3.11				
39. I give my opinions during class discussions.	Actual	2.26				
	Preferred	3.05				
40. The teacher asks me questions.	Actual	3.32				
	Preferred	3.21				
41. My ideas and suggestions are used during classroom discussions.	Actual	2.53				
	Preferred	2.95				
42. I explain my ideas to other students.	Actual	2.21				
	Preferred	2.58				
43. I am asked to explain how I solve problems.	Actual	2.32				
	Preferred	2.58				

Figure 1.3 Example of the data for one scale for the learning environment in the teacher feedback package for the pre-test

1.4.4 Step Four: Intervention

Step four involved teachers' planning, implementing and monitoring strategies aimed at improving the learning environment over a six to eight week intervention period. Teachers were encouraged to use the model, depicted in Figure 1.4, which was adopted from the action research model developed by Kemmis (Carr &

Kemmis, 1983) to guide their action research processes. Whereas past models have represented the action research process using a linear or circular representation, the model below was chosen because it represents action research as a continuous process of reflecting, planning, acting and describing as part of a teachers' professional development. Appendix A provides an example of one part of the guide and teacher planning sheet which was provided to teachers to assist them when using student feedback as part of the action research process.

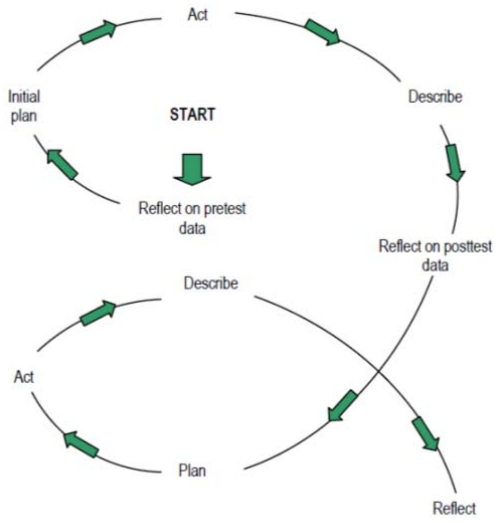


Figure 1.4 The model for action research adapted from Kemmis (Carr & Kemmis, 1983).

1.4.5 Step Five: Re-assessment

After teachers had implemented their selected strategies (over a six to eight week intervention period) the two instruments were re-administered to students. Only responses for students present for both the pre-test and post-test were used. These results were used to generate a post-test teacher feedback package which included similar profiles and information to the pre-test feedback package. These post-test results allowed teachers to examine whether their intervention strategies had led to changes in students' perceptions.

For the post-test feedback, a circular profile provided a comparison of the average item means for students' responses to the scales used to assess the learning environment for both the pre-test and the post-test. The second profile included a column graph depicting students' responses to the scales used to assess students' attitudes and academic self-efficacy beliefs (see Figure 1.5).

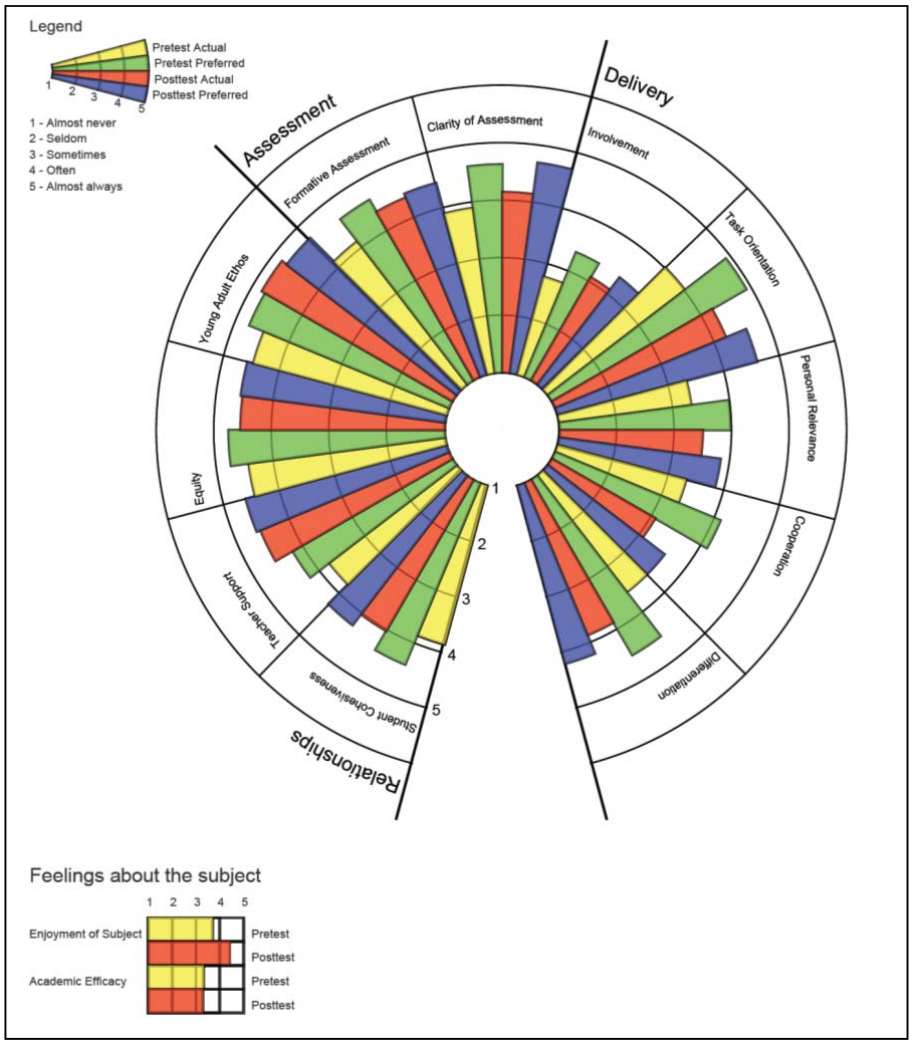


Figure 1.5 Example of the circular profile and column graphs used in the teacher feedback package for the post-test

As for the pre-test, a box plot was used to provide information about the variation of students' perceptions (Figure 1.6). The box plots for the post-test, however, only reported for the actual learning environment for the pre-test and post-test.

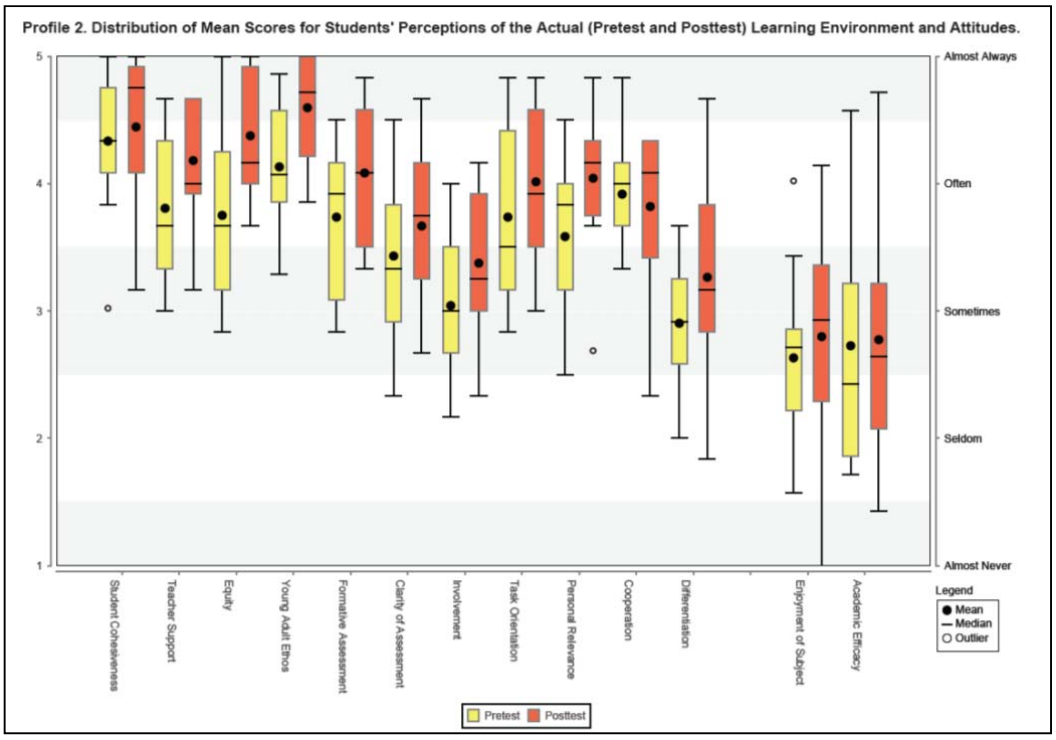


Figure 1.6 Example of the box plots used in the teacher feedback package for the post-test

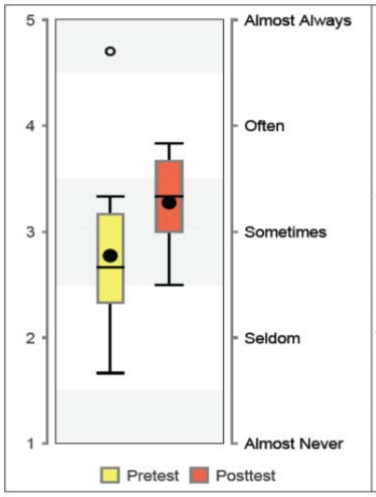
Finally, as with the pre-test feedback, teachers were provided with information about individual scales including a box plot and the item means for students' perceptions of the actual learning environment only for the pre-test and post-test. An example of the information provided for one scale is depicted in Figure 1.7.

The post-test feedback information aimed to provide teachers with a range of data that they could use to gauge the success of their improvement efforts. In keeping with the cycle of action research shown in Figure 1.4, the assumption was that teachers would then reflect on their post-test results and use this information to help to guide their plans for future classroom-based improvement.

Delivery

Cooperation

The **Cooperation** scale assesses the extent to which students work cooperatively with other students on learning tasks.
Theses scores represent students' perceptions of the **actual** learning environment only.



Mean (•): The average item mean on the pretest for the Cooperation scale was 2.77 with a standard deviation of 0.71, compared to the posttest average item mean of 3.27 with a standard deviation of 0.45.

Median Value (—): The median value for student responses on the pretest of this scale was 2.67 compared to a median value of 3.33 for students' responses on the posttest.

Range: On the pretest, the maximum score was 4.67 and the minimum score was 1.67. The maximum score on the posttest was 3.83 and the minimum score was 2.50. Note: These figures may include extreme outliers which are not shown in the chart.

For the pretest, 50% of students' scores fell between 2.33 and 3.00. For the posttest, 50% of students' scores fell between 3.00 and 3.50.

Average response for specific items for this scale

Item		1	2	3	4	5
56. We work in groups (or pairs) in this class.	Pretest	2.14				
	Posttest	2.43				
57. When I work in groups in this class, there is teamwork.	Pretest	3.21				
	Posttest	3.71				
58. I work with other students on assignments in this class.	Pretest	1.86				
	Posttest	2.43				
59. I cooperate with other students on class activities.	Pretest	3.07				
	Posttest	3.64				
60. I share my books and resources with other students when doing class work.	Pretest	3.14				
	Posttest	3.79				
61. I learn from other students in this class.	Pretest	3.21				
	Posttest	3.64				

Figure 1.7 Example of the teacher feedback for one scale of the learning environment instrument for the post-test

1.5 SIGNIFICANCE OF RESEARCH

The research presented in this thesis makes a significant contribution to learning environments research, teacher professional development and school improvement.

First, the research involved the development and validation of two instruments, one to assess the learning environment and the other to assess student's attitudes and academic self-efficacy beliefs. These two instruments provide an economical and efficient means for teachers to obtain feedback from students in their classrooms that can be used for reflection and to help guide improvement efforts. Importantly, one of these instruments included two dimensions which measure students' perceptions of the role of assessment in their learning, an aspect which has often been overlooked in past learning environments research.

Secondly, the data derived from these two instruments were used by teachers as part of a formal, structured professional development activity which helped foster in teachers, the development of reflective practices which resulted in students perceiving their classroom learning environments more positively. These findings contribute to past teacher action research which has been successful in improving classroom learning environments and provides further support to using student perceptual measures to help teacher decision-making and classroom improvement efforts.

Thirdly, the teacher action research, based on students' perceptions of their classroom learning environment, their attitudes and academic self-efficacy beliefs, as detailed in this thesis, provided for a number of the conditions which support teacher development and growth. This approach was teacher driven and involved teachers drawing on new and existing knowledge and understandings about teaching and learning to implement a classroom-based inquiry. This approach fostered the development of reflective practices and provided opportunities for collaboration. In addition, it highlighted the potential for schools and teachers to align their professional development activities to school priorities and improvement goals. The findings indicate that, for schools wanting to empower their teachers and improve teacher quality, it is important that improvement efforts begin in the classroom.

The findings are significant because it indicates that teacher action research based on student perception data may be more effective when implemented as part of a whole-school approach. In this way, there were greater opportunities for collaboration and

contributes positively to the creation of a school culture which values continuous learning and teacher leadership. The results and findings suggest that school-level data generated from the two instruments could be used by schools to gauge the success of their improvement initiatives and help guide future planning.

Lastly, the research presented in this thesis is significant because it demonstrates how a multi-method design where qualitative and quantitative methods can be successfully employed to address different aspects of a problem under investigation.

1.6 THESIS OVERVIEW

The research which forms the basis of this thesis is reported under six chapters. Chapter 1 has provided the background to and discusses the rationale for the research and the nature of the research problem under investigation. The chapter provided a justification for using student perceptual measures to help to drive teacher decision-making as part of a teacher development activity and provided an overview of the five-step procedure utilised by teacher participants involved in the research. This chapter also outlined the research questions, discussed briefly the significance of the research and presented an overview of the organisation of the thesis.

Chapter 2 provides a review of literature of the key areas underlying the research of the present study. This chapter begins with a review of research related to the relatively new field of school and teacher effectiveness and, within this area, a closer focus on research specific to improving teacher quality through teacher professional development, teacher action research and the development of reflective processes. As one of the main activities of the study was the development and validation of two instruments, one to measure students' perceptions of their learning environments and the other their attitudes and academic self-efficacy beliefs, the chapter reviews prior research related to these three areas and the instruments which have been developed to assess them.

Chapter 3 discusses the research method used and provides an insight into the procedural aspects of this study. The chapter describes the multi-method design which was used to address the research questions and provides the context for the

present study, detailing the sample and duration of the research, data collection and analysis.

Chapter 4 reports the development, analysis and results for the validation of the instruments used in this study. The chapter details first, the development of the two instruments, the Constructivist-Oriented Learning Environment Survey (COLES) and the Attitudes and Self-Belief Survey (ASBS) and secondly, the results of analyses of quantitative data to assess the construct validity of the two instruments.

Chapter 5 describes how the data generated using the two instruments (developed for the purpose of this study) was utilised by teachers and schools to improve their respective classroom learning environments. This chapter, which is dominated by qualitative methods of data collection and analysis, reports whether teachers considered their involvement in the research program to be worthwhile to their professional development and reports the efforts of one school and how their involvement in the research was used to support school improvement initiatives.

Chapter 6 begins with a summary of the results in relation to the five research questions which is then followed by a discussion of the practical, theoretical and methodological contributions of this research and the key limitations to the study. The chapter concludes with suggestions for future research related to teacher professional development which utilises student perceptual measures as the key driver for change and the potential of such activities for school improvement efforts seeking to improve teacher quality.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Whereas the previous chapter introduced the present study, this chapter provides a review of literature related to the key research areas which form the basis of the research reported in this thesis. These areas include: school improvement and effectiveness; teacher development, and learning environments research. This review of literature is reported using the following headings:

- School and Teacher Effectiveness (Section 2.2);
- Developing Teachers (Section 2.3);
- Learning Environments Research (Section 2.4);
- Students' Attitudes and Self-Beliefs (Section 2.5); and
- Chapter Summary (Section 2.6)

2.2 SCHOOL AND TEACHER EFFECTIVENESS

School Effectiveness and School Improvement (SESI) are relatively new areas of research (Creemers, Kyriakides & Sammons, 2010; Teddlie & Reynolds, 2000; Townsend, 2007), both of which came about largely in response to findings by Gage (1963), Coleman et al., (1966), Jencks et al., (1972) and Plowden (Central Advisory Council for Education, 1967) which suggested that schools and teachers had little influence on student outcomes.

According to Reynolds (2010), the field of school effectiveness and school improvement research (SESI), over the past 40 years has had four notable effects. Firstly, SESI research has effectively dispelled earlier suggestions (see for example Coleman et al., 1966 and Jencks et al., 1972) that schools do not make a difference. Secondly, SESI research has helped to define the key factors influencing school

effectiveness in relation to student outcomes and the processes which best enhance school improvement efforts (Bosker, Creemers & Stringfield, 1999; Reynolds & Teddlie, 2001; Teddlie & Reynolds, 2000). Thirdly, and perhaps most relevant to the context of the research reported in this thesis, SESI research has shown that teachers are important determinants of students' educational and social outcomes and, as a result, has helped to enhance the professional status of teachers and their role in effective schools. This body of research has established links between teacher behaviours and student achievement (Brophy & Good, 1986; Fisher et al., 1985; Stallings, 1980) and has shown how formal initiatives, aimed at getting teachers to develop and refine their teaching behaviours, can also enhance student learning (Good & Grouws, 1979; Hill et al., 1995). Lastly, SESI research has created an extensive knowledge base which encompasses the broader international context (Creemers, Reynolds, Stringfield & Teddlie, 1996; Teddlie & Reynolds, 2000). Reynolds concludes that the popularity of SESI research has countered earlier research and now the emerging view was "schools did not just make a difference, they made all the difference" (Reynolds, 2010, p. 4).

According to Rowe (2007), 'first generation' SESI research demonstrated that schools did indeed make a difference and that there were a number of process variables which characterised effective schools (Brookover et al., 1979; Brookover & Lezotte, 1979; Edmonds, 1979; Rutter et al., 1979). Contrary to the earlier estimate in the Coleman Report (Coleman et al., 1966), that school effects accounted for only 9% variance in student outcomes, later research suggested that, in fact, schools may account for at least 25% of the variance in student performance (Kovaks, 1998; Reynolds, 1996; Sammons, 1996).

Subsequent 'second generation' SESI studies, which utilised more sophisticated data analysis methods, went on to establish that class-level effects were more significant than both school-level and intake characteristics of students (Bosker, Kremers & Lugthart, 1990; Caldwell & Spinks, 1992; Creemers, 1994; Harris, 2001; Muijs & Reynolds, 2000; Scheerens, 1992). The first major empirical study in Australia into school and teacher effectiveness, the Victorian Quality Schools Project (Hill, Holmes-Smith & Rowe, 1993), confirmed Monk's (1992) analysis of a number of

studies that class membership was a strong determinant of student achievement, which was also supported by later research (Hill et al., 1995; Hill & Rowe, 1996, 1998; Rowe & Hill, 1998; Rowe & Rowe, 1999; Scheerans, 1992). These findings and later studies have established that, while organisational aspects of a school may provide the necessary preconditions for effective teaching, it is the quality of teacher-student interactions which determine student achievement (Caldwell & Spinks, 1992). These findings highlight the important influence of the teacher on student educational and social outcomes (Darling-Hammond, 2000; Harris, 2001; Hattie, 2003; Haycock, 1998).

These studies have contributed to a substantial body of research which clearly shows that the quality of what teachers know and can do has the greatest impact on student learning (Darling-Hammond, 2000; Ferguson, 1991; Ferguson & Ladd, 1996; Muijs & Reynolds, 2000, 2002; Wenglinsky, 2000) and that initiatives, aimed at getting teachers to develop and refine their teaching behaviours, can be used to enhance student learning (Good & Grouws, 1979; Ingvarson, Meiers & Bevis, 2005; Supovitz, 2001). According to Rowe (2007, pp. 15-16), the key message from a review of the research literature on educational effectiveness is that:

> Quality teachers and their professional development do make a difference, and that it is not so much what students bring with them that really matters, but what they experience on a day-to-day basis in interaction with teachers and other students in classrooms. While it may be difficult to legislate quality teaching into existence, the fact that teachers and schools make a difference should provide impetus and encouragement to those concerned with the crucial issues of educational effectiveness to at least invest in quality teacher recruitment, initial training and their on-going professional development.

This body of research on educational effectiveness provides convincing evidence that the impact of teachers on student learning is critical and that any attempt to improve schools needs to focus on what happens in the classroom (Rowe, 2004, 2007; Townsend, 2007). Teacher and school improvement is a major aim of schools in Western Australia and is evident in the Plans for Public Schools (Department of Education WA, 2008, 2011) as well as the plans in individual government and non-

government schools (AISWA, 2009). In an effort to revitalise and improve schools, as well as to link school improvement to student achievement, schools in Western Australia have engaged in a number of school improvement programs including the Innovative Designs for Enhancing Achievements in Schools (IDEAS); Raising Achievement in Schools (RAISe) and Getting It Right (GIR) (Ingvarson, 2002; Wildy & Faulkner, 2008). These programs have a clear focus on improving teaching practice with the aim of bringing about significant and sustained improvements at the classroom- and school-level.

While teachers are considered to be an essential lever of change in schools (because change is explicit in their classrooms and daily practices) and the likelihood that school effectiveness will improve in parallel with any change in teacher effectiveness (Munro, 1999), effective school improvement requires sustained efforts by the school as an organisation (Reezigt & Creemers, 2005). The existence of a school culture, committed to continuous improvement, is essential for schools attempting to introduce interventions that will help them to become more effective. The culture of an 'improving school', according to Reezigt and Creemers (2005), includes a range of underlying factors such as a shared vision, history and sense of ownership of improvement, leadership, staff stability and willingness to become a learning organisation.

Reezgit and Creemers (2005), in presenting a comprehensive framework for effective school improvement, contend that effective improvement requires school-level processes that focus on student outcomes as the primary goal. Although teachers are considered to be important in school improvement, individual teacher initiatives are not sufficient unless the school, as an organisation, sustains the efforts. At the school-level, they describe three concepts that can be considered to be key elements to an improving school: an improvement culture; improvement processes; and improvement outcomes. All three concepts are interrelated and constantly influence each other; highlighting the cyclical nature of school improvement which has no real start or endpoint. Within these concepts, the existence of an 'improvement culture' is strongly influenced by the school's willingness to become (or stay) a learning culture. Reezgit and Creemers (2005, p. 416) remark that

"schools that are not reflective are not likely to be improving". For improvement to be successful, it is necessary to create an environment in which teachers perceive themselves as learners and are willing to participate in training, development and collaboration with other teachers (Hargreaves, 1994; Timperley & Robinson, 1998).

In a bid to improve teacher effectiveness and the quality of learning in the classroom, an emphasis on teacher empowerment through distributed leadership is becoming increasingly popular (Copland, 2003; Crowther, Kaagan, Ferguson & Hann, 2002; Harris & Spillane, 2008; O'Donoghue & Clarke, 2010). A distributed leadership perspective assumes that effective leadership is the responsibility of all individuals within the organisation (Copland, 2003; Harris & Spillane, 2008), and has been used to describe various approaches to capacity building in schools. Common to most approaches are that distributed leadership is a collective activity based on collective goals; that is, tasks, responsibilities and power are spread between traditionally defined organisational roles and rest on the base of an expert rather than hierarchical authority. This means that authority may be redistributed to those who have the recognised expertise, i.e. teachers rather than those with formal or traditional power roles in a school (Copland, 2003; Harris & Spillane, 2008). Importantly, the concept of distributed leadership focuses on developing the potential of teachers and recognises the role that teachers can play in school renewal and the impact that they can have on student learning, school culture and community (Crowther et al., 2002; Senge, 2000).

One of the schools involved in the present study, the critical instance school (discussed in Chapter three), purposefully linked the research activities to their school revitalisation strategy which involved a five-phase school-based implementation strategy, commonly referred to as the Innovative Designs for Enhancing the Achievements of Schools **(**IDEAS) process.

IDEAS is a school revitalisation program that is characterised by a clear focus on teachers' actions in classrooms, distributed leadership and the building of professional learning communities (Crowther et al., 2010; Kruse, Louis & Bryk, 1995; Louis & Marks, 1996; Marks & Louis, 1999) and which is comprised of three key components. The first component is a research-based framework focused on

enhancing school outcomes grounded in the work of Newmann and Wehlage (1995) and developed by Crowther (1999), which aims to build organisational capacity (Andrews, 2008; Crowther, 2010; Crowther et al., 2010; King & Newmann, 1999; Scribner, Cockrell, Cockrell & Valentine, 1999). The second component is a five-phase school-based implementation strategy, commonly referred to as the IDEAS process. Finally, the third component is a shared approach to pedagogy and leadership, which Crowther refers to as 'parallel leadership'. Parallel leadership is a shared or distributed leadership model which features a balance between the strategic leadership of the principal and the pedagogical leadership of teachers in the school. Crowther (2001, p. 40) stresses that these are important because: "shared responsibility for school outcomes, involving teachers and principals in mutualistic relationships, is a vital key to successful school improvement"

The four operational principles that underpin the IDEAS process, position the teacher as central to improvement efforts. According to Andrews (2008, p. 50) these principles emphasise that: "teachers are the key to successful school revitalisation; professional learning is best thought of as a shared collegial process within each individual school; a 'no blame' mindset should permeate organisational problem-solving and a 'success breeds success' approach should guide teachers' analyses of their professional practices".

The school revitalisation processes, adopted by IDEAS, are described as multi-dimensional and involve the "development of a shared vision, the creation of a shared approach to pedagogy and school-wide operational planning" (Andrews & Lewis, 2002, p. 3). The approach values a management structure which involves school-based facilitators and management team, supported by external (university) consultants and the school managing time and resources, and provides for maximum flexibility and school-level autonomy. The development of teacher leadership is seen as the key to the school improvement program, requiring an uptake of processes by teachers to improve student learning (Andrews, 2008; Andrews & Crowther, 2002; Crowther, 2010; Wildy & Faulkner, 2008).

Research emerging from IDEAS has contributed a number of broad understandings of the factors and processes that contribute to whole school improvement. These

ideas highlight the importance of school context, sustained professional growth of the teaching community, individual and school-wide processes and distributed leadership (Andrews, 2008). These findings have been supported by similar studies which have investigated social and relational factors which enable effective school improvement (Bryk & Schneider, 2002; Louis, 2007; Mulford, 2007). Within the context of the research reported in this thesis, the critical instance school linked the action research activities of their teachers to their school priorities related to shared leadership, curriculum development and teacher professional development which formed the basis of their school improvement initiatives.

2.3 DEVELOPING TEACHERS

This section examines the issues surrounding teacher professional development including an examination of literature related to identifying the conditions and strategies which best support teacher development and growth. These sections are reported under the following headings: Teacher Professional Development and Professional Growth (Section 2.3.1); Teacher Action Research (Section 2.3.2) and Teacher Reflection (Section 2.3.3).

2.3.1 Teacher Professional Development and Professional Growth

Until recently, there was little evidence-based research to support the popular and somewhat anecdotal view regarding the links between effective teacher professional development and improved student outcomes (Cohen & Hill, 2000; Guskey & Sparks, 2002; Thomson, 2003). Although past studies have documented relationships between professional development, teacher learning and changes in classroom practice (Fullan, 1991; Hawley & Valli, 1999), Sykes (2002) suggested that the effectiveness of teacher professional development would be better measured through increases in student outcomes (using academic achievement measures) rather than changes in teacher practices. It has been strongly argued, however, that professional development which increases teachers' understandings of the content, how students learn, effective teaching and learning practices and ways to monitor and assess student learning are likely to improve student learning outcomes (Cohen & Hill, 2000; Sykes, 1999, 2002)

Despite the lack of evidence-based research, linking teacher professional development with improved student outcomes, teacher professional learning has been widely recognised as a critical component of school reform. Also, the growing body of research related to school effectiveness/improvement has identified clear connections between teacher professional learning and school improvement. As a result, teacher professional development is increasingly being viewed as the key driver in educational change and improving student outcomes (Darling-Hammond, 1999, 2000; Good & Grouws, 1979; Hawley & Valli, 1999; Hill et al., 1996).

Teacher professional development has long been used as a means of improving curriculum delivery and for the implementation of curriculum initiatives (Lankshear et al., 1997). More recently, the use of curriculum and assessment standards in the United Kingdom, United States and Australia has seen the emergence of more focused, systematic teacher professional development which provides evidence of clear links between teacher professional development and student learning outcomes (Ingvarson et al., 2005).

Within the Australian context, the Australian Government Quality Teacher Program (DEEWR, 2012) was a reform effort that endeavoured to provide professional development to teachers across Australia. The AGQTP, initially implemented from 2001 to 2009, focused on improving teacher quality and reinforcing the value of professional standards within the profession and teacher certification. The latter forming the major area of focus in the period 2011 to 2013 (DEEWR, 2012).

Reforms targeting teacher development in the hope of improving teacher quality was also reflected in the results from the 2009 Organisation for Economic Co-operation and Development (OECD) Teaching and Learning International Survey (TALIS) which concluded that better and more targeted professional development is an important lever in teacher and school improvement (Organisation for Economic Co-operation and Development, 2009).

A number of studies have sought to identify those conditions which best promote teacher learning in the workplace. Guskey and Sparks (2002) acknowledge that, while professional development is influenced by a variety of factors, the most

influential relate to content, process and context. According to Cohen and Hill (2000, p. 320), professional learning activities that are likely to be effective are those that are "grounded in the curriculum that students study, connected to several elements of instruction ... extended in time, [and include] follow-up during the school year". Research also suggests that professional development experiences that are situated within the school and classroom contexts in which teachers work are likely to be more effective than those that are not (Borko, 2004; Putnam & Borko, 2000). These kinds of learning opportunities contrast sharply with traditional professional development, which was typically conducted away from teachers' schools, was not explicitly focused on teachers' own instructional practice and did not provide opportunities for reflection and experimentation (Cohen, McLaughlin & Talbert, 1993; Little 1993; Porter et al., 2003). To develop a fuller understanding of how teachers' work experiences support the development of their practice, it is useful to look beyond their participation in traditional staff development and to consider a broader array of experiences which support teacher (adult) learning.

Mezirow (1985) identifies three kinds of learning that cater more effectively for adults that lead to change in performance, these being: instructional (which focuses on skill development); dialogic (which involves learning together to find understanding); and self-reflective (which involves finding understanding through self-reflection). Using these categories, traditional teacher learning activities have tended to be instructional and dialogic (Bransford, Brown & Cocking, 1999) and focused on the transmission of knowledge or skill acquisition (which were largely characterised by organised activities aimed at improving teacher knowledge or weakness) (Bransford et al., 1999; Clarke & Hollingsworth, 2002). Contemporary teacher development theories focus more heavily on the teacher as the learner (Ball & Cohen, 1999; Hawley & Valli, 1999; Little, 1993). O'Donoghue and Clarke (2010) suggest that if the aim is to build the intellectual and professional capacity of teachers in a school, it is important to consider what best enables teacher (or adult) learning. They point to the following five principles, proposed by Szabo and Lambert (2002, p. 204), as being fundamental to any approach that facilitates adult learning, these being:

- Learning is an active rather than passive process;
- Learning is by nature, social and more likely to occur when learners share ideas, enquire and problem solve together;
- Learners need opportunities to make sense of new knowledge and to create meanings for themselves based on individual and shared experiences;
- Reflection and meta-cognition contribute to the construction of knowledge and the process of sense-making; and
- New learning is mediated by prior experience, values and beliefs.

Guskey (2000) suggests that teacher professional development should be an intentional process that is purposeful and linked to what classroom teachers perceive their needs to be. Guskey (1986) proposed a four-step model of teacher change, which is significant in that it shows teacher learning as being most effective when it is linked to the classroom environment. It is generally agreed that teacher learning occurs best when taught in context, through experience, and within real life environments (Guskey, 2000; Kolb, 1984) in what has been referred to as 'authentic' professional learning (Harris & Grandgenett, 2002). While acknowledging the importance of situating professional learning in authentic contexts, Guskey's (1986) model has been criticised for its linear representation with researchers now tending to agree that the process of teacher change is non-sequential (Clarke & Hollingsworth, 2002; Day, 1999).

Clarke and Hollingsworth's (2002) interconnected model of professional growth highlights the complexity of professional development, allowing for multiple growth pathways between domains that are non-linear in structure. The model also emphasises the importance of the environment in which the change is to occur; recognising that while some school contexts support teacher professional growth, others may not (Clarke & Hollingsworth, 2002). Professional growth can also be constrained because of the nature of the classroom and the day-to-day events that can make it difficult for teachers to focus on their own learning goals (Little, 1993). These issues highlight the need for professional learning to focus on student outcomes and be embedded in teacher practice (Borko, 2004; Camburn, 2010; Putnam & Borko, 2000).

Hargreaves (1994) believes that teacher professional growth should be on-going throughout a person's career as professional development of this nature is more likely to lead to sustained change in classroom behaviours. Only when there is sustained change, will professional development be transformational in terms of teacher practice and pedagogy (Jacobson & Battaglia, 2001). Increasingly, the trend in teacher professional development has been towards activities that promote teacher development as part of an active, life-long learning process (Clarke & Hollingsworth, 2002; Day, 1999; Fullan 1991; McKenzie & Turbill, 1999; Richardson, 1999). As such, teacher professional development has a greater emphasis on providing teachers with experiences that foster reflective practice as a part of a continuous process directed toward professional growth (Lieberman & Miller, 2001; McLaughlin & Oberman, 1996).

According to Elmore (2000), the key to effective professional learning is to build a culture that is characterised by a collective responsibility for the practice of teaching and student learning. Such professional learning can be fostered through the use of professional learning communities. To strengthen and support these professional learning communities, there needs to be increased opportunities for teacher learning, based on evidence, drawn from classroom practice and student performance. In other words, effective teacher learning should be data-driven.

Hawley and Valli (1999, pp. 137-143), in reviewing the growing body of research, summarised nine principles for the design of effective professional development. These being to:

- Focus on what students are to learn and how to address the different problems students may have with learning the material;
- Be based on analyses of the differences between (a) actual student performance and (b) goals and standards for student learning;
- Involve teachers in the identification of what they need to learn and in the development of the learning experiences in which they will be involved;
- Be primarily school-based and built into the day-to-day work of teaching;
- Be organised around collaborative problem solving;

- Be continuous and on-going, involving follow-up and support for further learning - including support from sources external to the school that can provide necessary resources and new perspectives;
- Incorporate the evaluation of multiple sources of information on (a) outcomes for students and (b) the instruction and other processes that are involved in implementing the lessons learned through professional development;
- Provide opportunities to gain an understanding of the theory underlying the knowledge and skills being learned; and
- Be connected to a comprehensive change process focused on improving student learning.

Similarly, Supovitz (2001, p. 965) identified six components widely considered to be critical to teacher professional development. He states that teacher professional development should:

- Immerse teachers in inquiry, questioning and experimentation, modelling inquiry forms of teaching;
- Be intensive and sustained;
- Engage teachers in concrete teaching tasks;
- Include a focus on subject matter knowledge and deepen teachers' content skills;
- Be grounded in a common set of professional development standards and show ways to connect to student performance standards; and
- Connect to other aspects of school change.

Since the work of Hawley and Valli (1999), research has supported the identification of a core set of features that constitute effective teacher professional development. A study involving a survey of 1027 mathematics and science teachers supported the link between effective teacher development and improved teacher outcomes (Garet, Porter, Desimone, Birman & Yoon, 2001). The results found that sustained and intensive professional development, which is content-focused, provides opportunities for hands-on activities and is integrated into teachers' day-to-day work, is likely to enhance teacher knowledge and skills.

Within the Australian context, an analysis of teacher professional development programs by Ingvarson et al. (2005) found that effective teacher development

programs share a number of common features, all of which were consistent with the principles summarised by Hawley and Valli (1999) and Supovitz (2001). They found that the most effective teacher professional development programs were those that: provided teachers with opportunities to focus on student learning and ways to support students to learn the subject matter; provided opportunities to examine student work collaboratively and in relation to relevant achievement standards; drew on research-based knowledge about how students learn content; involved teachers actively reflecting on their practice and professional standards; identifying their professional needs and identifying ways to address those needs; provided time to practice their learning or new understandings; and used activities which encouraged teachers to 'deprivatise' their practice thereby sharing their work with others and seeking feedback from colleagues rather than working in isolation.

A more recent review of research literature, which examined the impact of teacher professional learning on teachers' practices and student learning, concluded that, to ensure the effectiveness of teacher professional learning, activities should: be intensive, on-going and connected to practice; focus on student learning and address the teaching of specific content; align with school improvement priorities and goals; and build strong relationships among teachers (Darling-Hammond et al., 2009). In building strong relationships, Desimone (2009) asserts that such activities should involve and encourage the collective participation of teachers from the same school or teaching context. The results of the National Mapping of Teacher Professional Learning Project indicated that teacher learning should also be "supported by strong and flexible leadership, both within school settings and at the systems level" (Doecke, Parr & North, 2008, p. 46). The project, which examined and compared the full range of professional development activities undertaken by 4572 teachers, concluded that, while it was not possible to identify one form of professional development as being better than the other, it provided further support for the conditions in which professional learning should occur.

Importantly, the report (Doecke et al., 2008, p. 274), stressed that professional learning is an:

> Important form of capacity building, and is a lever for reform and both school and system-wide levels … [Professional development should not be viewed] as an add-on but rather, as an integral part of teachers' professional lives which best occurs over a sustained period of time instead of one-off professional development sessions which are generally perceived to be of little value.

The professional development activities which were developed in my study attempted to incorporate the key features for effective professional development, outlined above. It aimed to provide opportunities for teachers to reflect on data derived from the perceptions of students in their classroom and to work collaboratively or independently within their school context, to devise and implement strategies to improve the classroom learning environment.

As part of their involvement in this research, teacher participants were encouraged to use an action research process as the core professional development activity. Teacher action research was considered to be the most appropriate vehicle to support this form of professional learning as it not only offered a good degree of flexibility, but also provided opportunities for collaboration and encouraged active and sustained participation. The process also encouraged participants to use feedback information, gathered from their students, for reflection and improvement. The following section reviews literature related to teacher action research.

2.3.2 Teacher Action Research

Action research has emerged as a popular tool for professional development, particularly in educational settings (Grundy, 1995). It is described as a self-reflective form of inquiry undertaken by participants in social or educational situations to improve their practices or understanding of these practices (Carr & Kemmis, 1983; Kemmis & McTaggart, 1988). In terms of teacher professional development, Carr and Kemmis (1983) maintain that it is beneficial for teachers to conduct research about their classroom practices and teaching skills as part of an action research process.

The use of action research, as a tool for professional development, allows teachers to take on the role of researcher and to gather relevant evidence to inform their practice

(as opposed to relying on advice from those who may not be as familiar or sensitive to the teaching and learning of their classrooms) (Hubbard & Power, 2003). Past studies indicate that teachers who engage in action research have a higher sense of efficacy and, as a result, an increased willingness to seek solutions to dynamic classroom issues (Holly, Arhar & Kasten, 2005; Stringer, 1999).

Action research, according to Bryman (2008, p. 397), is "an approach in which the action researcher and members of a social setting collaborate in the diagnosis of a problem and in the development of a solution based on the diagnosis". It is widely accepted that teacher action research involves research that is undertaken by teachers in their own classrooms. Reeves (2008) found that, when teachers are given the opportunity to engage in action research on a sustained basis and in a collaborative environment, three things occur: first, there is often a direct and measurable impact on student achievement, behaviour and educational equity; second, teacher researchers affect the professional practices of their colleagues; and third, effective professional practices are reinforced and repeated by both the teacher researcher and with those teachers who are influenced by them. According to Reeves (2008), by engaging teachers directly in the analysis of data, forming essential questions about that data and collaborating to discover answers which are applicable to their classrooms and schools, teacher research can have a direct impact on student achievement, classroom practice and provide opportunities for sustained professional development.

In addition to providing benefits to the action researcher, Reeves (2008) also asserts that teachers who engage in classroom research are likely to influence the performance of other teachers and school leaders. Their activities can lead others to seek out and engage in similar professional development activities to improve their own practice. Reeves (2008) reported that teachers were just as influenced by the professional practices and action research of their peers as the influences of students, family and personal experiences.

The purpose of action research, in general, can be clustered into two key ideas. One involves teachers' "sense of professional role and identity" (Lankshear & Knobel 2004, p. 4) and the other is related to improving teaching quality and practices. In

both cases, an integral aspect of action research is the emphasis on practical outcomes and the importance of the investigator being part of the field of study. Action research is a systematic form of inquiry that often involves the collection of both qualitative and quantitative data (Bryman, 2008; Creswell, 2005; Mills, 2000), and is advocated because of its capacity to involve the people who participate in the diagnosis and subsequent formulation of ways to address problems.

The action research processes undertaken by teacher participants, as reported in my study, reflects Lankshear and Knobel's (2004) view that action research involves the participation of teachers in the research process with a view to improving teaching and learning through informed professional judgments. In this way, teachers were required to systematically question their own teaching as the basis for development. The present research involved, what Creswell (2005) described, as practical (as opposed to participatory) action research. In this respect, the action research process focused on teacher development and involved individual and team-based inquiry. The major ideas or principles behind this form of practical action research, as stated by Creswell (2005, p. 553):

- Teacher-researchers have decision-making authority to examine their own educational practice as part of their own on-going professional development;
- Teacher-researchers are committed to continued professional development and school improvement, which is a core assumption for any teacher who decides to engage in action research;
- Teacher-researchers want to reflect on their practices so that they can improve their practices. They reflect individually or in school-based teams composed of students, teachers, and administrators;
- Teacher-researchers use a systematic approach for reflecting on their practices (i.e. that they use identifiable procedures to study their own problems rather than using a random, anything-goes design); and
- Teacher-researchers choose an area of focus, determine data-collection techniques, analyse and interpret data, and develop action plans.

Action research generally involves a spiral of critical, self-critical and reflective processes, during which the teacher learns more about his or her teaching practices

(Capobianco, Lincoln, Canuel-Browne & Trimarchi, 2006; Manfra, 2009). An essential component of this action research spiral is the need for reflection, which has been described as a way of thinking about a problematic situation that needs to be resolved. According to Fullan (1999), it is only through reflection that teachers begin to question and think differently about their teaching practices. In this respect, reflection provides the opportunity to be aware that a problem exists. Kemmis and Wilkinson (1998) assert that it is through reflection that teachers are able to investigate reality in order to change it. The next section examines more closely the role of reflection in teaching.

2.3.3 Teacher Reflection

Increasingly, reflective practice has been recognised as central to teaching and learning (Brookfield, 1995, 2005; Zeichner & Liston, 1987) and is considered to be "essential to identifying, analysing, and solving the complex problems that characterise classroom thinking" (Spalding & Wilson, 2002, p. 1394). The value of reflection lies in the idea that teacher actions and or behaviours will be better considered and, as a result, both teachers and students will benefit (Spalding & Wilson, 2002).

Early definitions of reflection originate in the writings of John Dewey (1933, p. 9), who described reflection as action based on "the active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it". Dewey (1933) argued that reflection consists of a number of steps and draws a clear distinction between what he described as impulsive action, routine action and reflective action. Dewey emphasised the importance of active and deliberate engagement with a problem, underpinned by an awareness of one's ideas and attitudes, as central to reflection and which leads to some form of action. Dewey asserts that "thinking is the accurate and deliberate institution of connections between what is done and its consequences" (Dewey, 1981, p. 505). According to Dewey, teachers need to develop particular skills in order to reflect effectively (e.g. skills of observation and reasoning) as well as possess the qualities of open-mindedness, whole heartedness and responsibility.

Donald Schön (1983, 1987) expanded the work of Dewey, placing further emphasis on the importance of teacher experience and knowledge. Schön's work is noted for the terms 'reflection-in-action' and 'reflection-on-action'. In what Schön (1983) describes as the cycle of appreciation, action and re-appreciation, a reflective teacher critically evaluates his or her practices, formulates ideas for improvement and then puts them into action. Within this cycle, Schön describes reflection-in-action as what happens when teachers are presented with "novel puzzles or puzzles of practice" (Munby & Russell, 1990, p. 72) and involves, not so much thinking about the action, but the very act of reflecting during the activities of practice. In contrast, reflection-on-action relates to teachers reflecting back on and critiquing or evaluating their teaching practices. Merriam and Caferella (1999) argue that this form of reappraisal can be useful in two ways. First, it can help to reinforce an individual's commitment to a particular method which has been successful and, second, challenges existing perspectives which results in changes in practice.

In contrast to Schön, Van Manen (1977) views reflection as being comprised of three elements (technical rationality, practical reflection and critical reflection), while Valli (1990) includes moral reflection as a fourth element. Korthagen (2001) regards reflection as consisting of organised, rational, language-based decision-making processes that include non-rational, gestalt-type operations.

An emphasis on critical reflection is central to contemporary approaches to reflection. Jay and Johnson (2002) regard reflective practice as being comprised of three steps, these being: description, comparison and criticism. The descriptive stage focuses on problem setting (as initially described by Schön, 1983), during which the teacher decides which aspect of their classroom or their practice should form the core of their reflections. The comparison stage involves the teacher "thinking about the matter for reflection from a number of different frameworks" (Jay & Johnson, 2002 p. 78). During this stage, the teacher begins to make sense of different viewpoints in order to develop a new frame of reference. The critical stage of reflection, involves the teacher making decisions based on the analysis of the situation and careful consideration and deliberation of the information gathered. It is during this last stage that the teacher formulates a plan of action.

Van Manen (1995) acknowledges that contemporary notions of reflection are complicated by the practical context within which reflections occur. He asserts that 'retrospective reflection' on past experiences, differs significantly from 'anticipatory reflection on future experiences' and 'contemporaneous reflection' characterised by more immediate reflections which may occur during the 'very moment of acting'. Van Manen (1995), in exploring experiences of reflection-in-action, concludes that the need for teachers to critically reflect in action should be reconsidered. This notion is agreed upon by Molander (1992) and Sockett (1987) who challenge that the idea of critical reflection in teaching could be a misplaced emphasis. In contrast to Schön (1983, 1987), Van Manen (1995) suggests that the functional epistemology of practice could be compromised if teachers try to be constantly aware of what they are doing and why. He argues that teacher reflection should involve purposeful thought about the relationship between an intention and the action as well as prospective reflection characterised best by anticipatory action research (Conway, 2001; Van Manen, 1995).

It is generally agreed that knowledge about teaching is best informed by teaching experience and, according to Darling-Hammond and McLaughlin (1995, p. 597), activities which aim to develop teachers "should provide occasions for teachers to reflect critically on their practice and to fashion new knowledge and beliefs about content, pedagogy and learners". Research investigating the connection between teacher's beliefs and reflection shows that teacher action is often determined by teacher understandings (Feiman-Nemser, 2001; Haritos, 2004; Uhlenbeck, Verloop & Beijaard, 2002). Research investigating the connection between teacher's beliefs and reflection indicates that existing understandings serve as a lens for interpreting events and influence the way that teachers make decisions in the classroom (Calderhead, 1989). Furthermore, teachers can identify and build on existing understandings to produce new knowledge and make generalisations from particular experiences which will assist them to apply new practices (Carr & Kemmis, 1983; Dewey, 1916; Doyle & Carter, 2003; Schön, 1983; Van Manen, 1977, 1994). It has been suggested that reflections may be influenced more by the context and past experiences than from deliberate thought and reflection (Schiff, Van House & Butler, 1997) and that teacher actions are often guided by the particular context

presented to them (Greeno, 1989; Hutchins, 1995; Lave, 1988). Rodgers (2002) describes teacher reflections, which draw on past experiences and professional knowledge, as useful for "generating different explanations for or conjectures about what's going on and choosing a theory or hypothesis about one's practice that one could test in action" (Rodgers, 2002, p. 244).

Schön (1983, 1987) claims that an understanding of alternative perspectives about one's teaching lies at the heart of teacher professional development and that the perspectives of students can provide teachers with a valuable source of data for personal reflection. Seeking alternative perspectives through the eyes of students in the teacher's class can help teachers to question assumptions and to view their own practice (Aldridge & Fraser, 2008; Bustingorry, 2008; Hoban & Hastings, 2006; Rhine, 1998). Research using student perception data to examine classroom learning environments shows that teachers are able to use this data for reflection to guide their improvements to the classroom environment (Aldridge & Fraser, 2008). This research highlights the importance of teacher reflection and contributes to the growing recognition that professional development that engages teachers in active reflection on their teaching, either through joint work with fellow teachers or by working with instructional experts, can be particularly effective in supporting the adoption of new instructional practices (Borko, 2004; Hawley & Valli 1999; Porter et al., 2003; Putnam & Borko 2000; Rodgers 2002; Supovitz & Turner 2000).

2.4 LEARNING ENVIRONMENTS RESEARCH

According to Fraser (1998), the learning environment of a classroom encompasses the overall climate, culture, ambience or atmosphere in which learning takes place, including the aspects which give a classroom a particular feel or tone, and is comprised of two parts: the human and the physical environment. The human environment includes the students and teachers and the interactions between each other, while the physical environment includes the materials and the settings, such as the furniture, lighting and the physical arrangements of these items.

This definition was expanded upon in a report of a recent review undertaken by the United Nations Educational Scientific and Cultural Organisation (UNESCO, 2012)

which set out to report on the vast and diverse body of research related to the concepts, perspectives and empirical evidence on learning environments with the aim to inform international education community of new ways to assess and improve the quality of learning environments. In their report, *A Place to Learn: Lessons from Research on Learning Environments* (UNESCO, 2012), it is acknowledged that some confusion exists between the terms, 'learning environment', 'conditions for learning', 'school (or classroom) climate', 'school (or classroom) culture' and 'organisational (of schools) climate'. To help to clarify this confusion, they define the learning environment as referring to "the complete physical, social and pedagogical context in which learning is intended to occur" and the "factors embedded within the shared physical and social learning environment... that influence learning processes", referred to as "conditions of learning" (UNESCO, 2012, p. 12). The classroom climate, therefore, refers to the general atmosphere of a learning space, which is influenced through a range of factors, including values, symbols, languages, communication and behaviour codes shared by a learning group (UNESCO, 2012).

2.4.1 History of the Field of Learning Environments

The focus on classroom learning environments has been influenced by social cognitive theory, most prominently by Bandura, Vygotsky, Piaget and Bruner, which has seen the emergence of constructivist learning methodologies and the desire to create optimal learning environments which use stimulating materials and learning activities to guide, motivate and support student learning (Hamilton & Ghatala, 1994; Schunk, 2004). Learning environments research has its roots in the work of early social psychologists with the earliest recorded classroom climate research undertaken by Thomas (1929). This research focused on the observation and recording of classroom happenings. While early educational research focused on classroom variables such as ability and achievement, the focus has since shifted towards an investigation of other variables which influence student outcomes. Walberg's (1981) model of educational productivity highlighted the learning environment as one of nine determinants on student outcomes and Fraser (1989)

described the effects of the classroom environment on student learning as 'subtle and nebulous'.

Contemporary learning environments research has been shaped by a number of influential figures who were initially most prominently associated with person-environment (P-E) fit research. P-E fit research refers to the congruence, match, or similarity between the person and environment (Dawis, 1992) and can be traced back to Parsons (1909) who devised a matching model to describe the fit between the person and different vocations. Lewin's field theory (1935, 1951), initiated the idea that behaviour is a function of the person and the environment, as expressed by the formula $B = F(P,E)$. This proposed that behaviour is determined by the interaction between the individual and their environment. While Lewin's theory acknowledged that the person and the environment jointly influence behaviour, it did not specify the nature of the effect.

Murray (1938, 1951) expanded on Lewin's work by exploring additional effects within the system; proposing that an individual's behaviour is affected by one or more pressures from within the individual's environment. Murray's needs-press Model included a typology that described and categorised different needs as conscious or unconscious; viscerogenic or psychogenic (physiological or psychological) and latent or manifest (hidden or openly expressed) (Murray, 1938). The pressures or forces on an individual's behaviour within this system were termed as a 'press' and referred to forces which would either promote or hinder the realisation of an individual's needs. Murray distinguished between two types of environmental 'press' at play, as 'alpha' press, which referred to the environment as it actually exists (according to an external observer), and a 'beta' press, describing the environment as perceived by the individual. Stern, Stein and Bloom (1956) in applying this idea, distinguished further between the two terms by clarifying that the 'alpha press' could be better understood as being a 'consensual' group view of the environment while the 'beta press', refers to the personal view held by an individual of the environment. Like Lewin (1935, 1951), Murray's (1938, 1951) work was influential in P-E fit research and helped to describe needs but did not attempt to explain the nature and effects of the needs-press match (Edwards, 2008).

Early P-E fit research was considered key to studies of educational environments and influenced the view that students' and teachers' perceptions of classroom environments could be compared with the observations and notes taken by a party external to the immediate environment, generally a researcher (Brophy & Good, 1986). The shift towards defining classroom or school environments in terms of shared perceptions has some advantages. Firstly, information gathered through the eyes of the participant allows data, which may have otherwise been missed by an external observer, to be captured. Secondly, students are in a good vantage point to offer evaluations of the classroom as they have experienced many different learning environments. Thirdly, student perceptions often provide a more consistent judgement of teacher behaviours as they have spent enough time in a class to form an accurate overall impression of the classroom environment which is not impacted upon by variations in teacher behaviours which may otherwise influence the judgements of an external observer (Fraser, 2007).

The work of Lewin (1935, 1951) and Murray (1938, 1951) and the perceived benefits of achieving a person-environment fit influenced the work of Leary (1957) and was followed by the independent works of Moos (1979) and Walberg (1976, 1979). Expanding on the work of Lewin (1935, 1951), Moos (1979) focused on the psychosocial aspects of a range of environments and formulated a conceptual framework which centred more closely on individual perspectives of the environment, as defined by Murray's (1938, 1951) needs-press model. This conceptual framework has been influential in the development of a large number of instruments designed to assess classroom learning environments. Moos' conceptual framework categorises the environment as having relationship, personal growth, system maintenance and system change dimensions. While relationship dimensions are concerned with the nature and intensity of personal relationships, personal growth dimensions focus on opportunities for personal development and self-enhancement. System maintenance and system change dimensions assess the extent to which the environment is orderly, clear in expectations, maintains control and is responsive to change.

Walberg's (1976, 1979) work which utilised a questionnaire to collect students' perceptual data showed that valid summary judgements could be made by students about their classroom learning environments and that these perceptions could be used in learning environments research. From this point in time, learning environments research has developed rapidly and this has contributed to the existence of a large body of research literature related to the conceptualisation, evaluation and investigation of student and teacher perceptions of psychosocial dimensions of the learning environment (Fraser, 2012; Fraser & Walberg, 1991; MacAuley, 1990; von Saldern, 1992).

2.4.2 Instruments for Assessing the Classroom Environment

The initial thrust of my research lay in tapping into past learning environment research to develop a tool that teachers could use to gather data about their classrooms. Over the past 50 years, a wide range of learning environment instruments have been developed for use in different contexts. This section provides a brief description and overview of 10 historically important and contemporary classroom learning environment surveys. Table 2.1 summarises these classroom learning environment instruments and classifies the scales of each of the instruments according to Moos (1979) scheme.

2.4.2.1 Learning Environment Inventory (LEI)

The Learning Environment Inventory (LEI) was developed and validated as part of the Harvard Project Physics in the 1960s to assess students' perceptions of the social climate of secondary classrooms (Walberg & Anderson, 1968). The final version was comprised of 15 dimensions and 105 items (seven items per scale) which were considered to be descriptive of typical classroom environments. This questionnaire required students to respond to items with four response alternatives, namely, Strongly Disagree, Disagree, Agree or Strongly Agree with the scoring direction reversed for approximately half of the items. Although the LEI is considered to be the forerunner of instruments that followed, its factorial validity was never established. It had other shortcomings, the questionnaire comprised of 105 items was considered too large and time consuming, the language considered too difficult for

some high school students and there was some debate over the distinctive nature of the dimensions. In today's context, the LEI is considered to be more applicable to teacher-centred classrooms characteristic of the past than the more student-centred, constructivist classrooms of the present day.

2.4.2.2 Classroom Environment Scale (CES)

The Classroom Environment Scale (CES) was developed by Rudolf Moos whose research involved perceptual measures of nine different human environments, including hospitals and correctional institutions (Moos, 1974). The final version of the CES included nine scales, each with ten items that were responded to using a True/False response format. The scoring was reversed on almost half of the items. The CES was one of the first instruments developed, in various forms, to allow the measurement of the preferred classroom environment. The preferred forms measure perceptions of the environment ideally liked or preferred and are concerned with goals and values orientation. While the CES proved useful as a measure of the learning environment, it was, like the LEI, more suited to teacher-centred classrooms and its factorial validity was never established. Other issues related to the CES included the extent to which a two-point response scale provides for sufficient discrimination and its suitability for providing an accurate gauge of students' perceptions.

Table 2.1 Overview of scales in ten learning environment instruments, including the source, level of applicability, number of items per scale and the scales classified according to Moos' (1974) scheme

Instrument	References	Level	Example item	Items per scale	Scales classified according to Moo's scheme		
					Relationship dimension	Personal development dimension	System maintenance and change dimension
Learning Environment Inventory (LEI)	Fraser, Anderson & Walberg (1982) Walberg & Anderson (1968)	Secondary	The pace of the class is rushed. (Speed)	7	Cohesiveness Friction Favouritism Cliqueness Satisfaction Apathy	Speed Difficulty Competiveness	Diversity Formality Material Environment Goal Direction Disorganisation Democracy
Classroom Environment Scale (CES)	Moos (1974) Moos & Trickett (1987)	Secondary	The teacher takes a personal interest in the students. (Teacher Support)	10	Involvement Affiliation Teacher support	Task orientation Competition	Order and organisation Rule clarity Teacher control Innovation
Individualised Classroom Environment Questionnaire (ICEQ)	Fraser (1990); Rentoul & Fraser (1979)	Secondary	The teacher considers students' feelings. (Personalisation)	10	Personalisation Participation	Independence Investigation	Differentiation
My Class Inventory (MCI)	Fisher & Fraser (1981) Fraser, Anderson & Walberg (1982) Fraser & O'Brien (1985)	Upper Primary	Children seem to like the class. (Satisfaction)	6 to 9	Cohesiveness Friction Satisfaction	Difficulty Competiveness	
College & University Classroom Environment (CUCEI)	Fraser & Treagust (1986) Fraser, Treagust & Dennis (1986)	Higher Education	Activities in this class are clearly and carefully planned. (Task Orientation)	7	Personalisation Involvement Student Cohesiveness Satisfaction	Task Orientation	Innovation Individualisation

Instrument	References	Level	Example item	Items per scale	Scales classified according to Moo's scheme		
					Relationship dimension	Personal development dimension	System maintenance and change dimension
Questionnaire on Teacher Interaction (QTI)	Créton, Hermans & Wubbels (1990) Wubbels, Brekelmans & Hooymayers (1991) Wubbels & Levy (1993)	Primary and Secondary	She/he gets angry. (Admonishing)	8 to 10	Helpful/Friendly Understanding Dissatisfied Admonishing		Leadership Student Responsibility and Freedom Uncertain Strict
Science Laboratory Environment Survey (SLEI)	Fraser, Giddings & McRobbie (1995) Fraser, McRobbie & Giddings (1993)	Upper Secondary/ Higher Education	I use the theory from my regular science class sessions during laboratory activities. (Integration)	7	Student Cohesiveness	Open-Endedness Integration	Rule Clarity Material Environment
Constructivist Learning Environment Survey (CLES)	Taylor, Fraser & Fisher (1997)	Secondary	In this class, I get a better understanding of the world outside of school. (Personal Relevance)	7	Personal Relevance Uncertainty	Critical Voice Shared Control	Student Negotiation
What is Happening in this Class? (WIHIC)	Fraser, McRobbie & Fisher (1996) Aldridge, Fraser & Huang (1999)	Secondary	Members of the class are my friends. (Student Cohesiveness)	8	Student Cohesiveness Teacher Support	Investigation Task Orientation Cooperation	Equity
Technology-Rich Outcomes-Focused Learning Environment Instrument (TROFLEI)	Aldridge & Fraser (2008)	Secondary	The teacher talks with me. (Teacher Support)	8	Student Cohesiveness Teacher Support Involvement Young Adult Ethos	Investigation Task Orientation Cooperation	Equity Computer Usage Differentiation

Adapted from Fraser (1998, pg. 531) with permission.

2.4.2.3 Individualised Classroom Environment Questionnaire (ICEQ)

The Individualised Classroom Environment Questionnaire (ICEQ) was developed by Rentoul and Fraser (1979) and distinguishes between conventional classrooms and more constructivist classrooms where student curricula and teaching caters for individual needs. It assesses individualised dimensions in the secondary classroom including Personalisation, Participation, Independence, Investigation and Differentiation. The development of the questionnaire was guided by literature on open and inquiry-based education, extensive interviewing of teachers and secondary school students and reactions to draft versions, sought from selected experts, teachers and students. Like the CES, the ICEQ was also developed in various forms to allow the measurement of the teachers' and students' perceptions of their actual and preferred classroom environment. Thorpe, Burden and Fraser (1994) describe, in their research, the case study of one teacher who used data collected from a short form of the ICEQ to devise an intervention targeting five dimensions which showed large actual-preferred discrepancies. After the intervention period, the ICEQ was re-administered to the class group and the resulting data used to evaluate the strategies which were implemented.

The final version of the ICEQ (Fraser, 1990) was comprised of five dimensions or scales, each with ten items. The ICEQ also includes a short version with 25 items (five items in each scale). In both versions, items are responded to on a five-point scale using the alternatives of Almost, Never, Seldom, Sometimes, Often and Very Often with the scoring direction reversed for many of the items.

Although some aspects or dimensions of the ICEQ were considered to be relevant to the research reported in this thesis, because the factorial validity of the ICEQ has not been well-established, it was not used. One scale of the ICEQ, the Differentiation scale, was considered to be particularly relevant and was modified for use for the research program.

2.4.2.4 My Class Inventory (MCI)

The LEI was simplified to form the My Class Inventory (MCI) for use with children aged eight to 12 years (Fisher & Fraser, 1981; Fraser, Anderson, & Walberg, 1982; Fraser & O'Brien, 1985; Majeed, Fraser & Aldridge, 2002; Mink & Fraser, 2005). Although the MCI was originally developed for use at the primary school level, it has been found to be useful at lower secondary level with students with limited reading skills.

The MCI differs from the LEI in four ways. Firstly, the number of scales and items were reduced to help to overcome the problem of survey fatigue in younger children and it contains only five of the LEI's original scales. Secondly, to help to improve the readability, the item wording was simplified. Thirdly, the response format was reduced to a two-point, yes or no format and, finally, students responded directly on the questionnaire rather than using a separate sheet.

The final version of the MCI contained 38 items, although a shorter 25 item version has also been developed (Fraser & O'Brien, 1985). Goh, Young and Fraser (1995) have successfully used a modified version of the MCI which makes use of a three-point response format (Seldom, Sometimes and Most of the Time). Given that the MCI was developed for use at the primary school level and the factorial validity in past studies has not been established, it was not considered suitable for the present study.

2.4.2.5 College and University Classroom Environment Inventory (CUCEI)

Although the present study was undertaken at the high school level, the College and University Classroom Environment Inventory (CUCEI) is worth mentioning as it is an example of an important development in the assessment of the learning environment. The CUCEI, initially developed by Fraser and Treagust (1986), was the first instrument to assess the learning environment in higher education institutions.

The CUCEI was designed for use in classes of approximately 30 students in seminar classes rather than lecture groups (Crump & Rennie, 2004; Fraser & Treagust, 1986;

Fraser, Treagust & Dennis, 1986; Fraser, Williamson, & Tobin, 1987; Logan, Crump & Rennie, 2006). The final version of the CUCEI contained seven seven-item scales, with each item responded to on a four-point scale (Strongly Agree, Agree, Disagree, Strongly Disagree). Polarity is reversed for approximately half of the items.

2.4.2.6 Questionnaire on Teacher Interaction (QTI)

The Questionnaire on Teacher Interaction (QTI) was developed in The Netherlands and focuses on the nature and quality of interpersonal interactions between teachers and students (Creton, Hermans & Wubbels, 1990: Wubbels, Brekelmans & Hooymayers, 1991; Wubbels & Levy, 1993). Wubbels and Levy (1991) developed an English version of the QTI for use in the United States which evaluated teacher-student relationships in secondary schools (Wubbels et al., 1991; Wubbels & Levy, 1993). Cross validation and comparative work using the QTI has also been undertaken in Australia (Fisher, Henderson & Fraser, 1995), Singapore (Goh & Fraser, 1996, 2000; Quek, Wong & Fraser, 2005) and Brunei (Riah, Fraser & Rickards, 1997). It has also been cross validated for secondary schools in Brunei and Malay (Khine & Fisher, 2002; Scott & Fisher, 2004) and translated versions have been cross-validated in Korea (Kim, Fisher & Fraser, 2000; Lee, Fraser & Fisher, 2003) and Indonesia (Fraser, Aldridge & Soerjaningsih, 2010).

The QTI evaluates teachers' interpersonal behaviour using eight scales, all of which fall within Moo's (1974) relationship dimension. Although valuable in its own right, as the QTI focuses only on assessing the relationships in the learning environment (specifically the relationship between teacher and the students), it was not considered for use in the research program reported in this thesis.

2.4.2.7 Science Laboratory Environment Inventory (SLEI)

The Science Laboratory Environment Inventory (SLEI) was developed specifically to assess the environment of science laboratory classes at the senior high school or tertiary education level (Fraser, Giddings & McRobbie, 1995; Fraser & McRobbie, 1995; Fraser, McRobbie & Giddings, 1993). The SLEI has five scales, each with seven items that are responded to using a five-point frequency response format of

Almost Never, Seldom, Sometimes, Often and Very Often. The five scales are Student Cohesiveness, Open-Endedness, Investigation, Rule Clarity and Material Environment. The SLEI was tested and validated with a sample of more than 5447 students in 269 classes in six countries including the US, Canada, Great Britain, Israel, Australia and Nigeria (Fraser et al., 1995; Fraser & McRobbie, 1995; Fraser et al., 1993). The SLEI has also been cross-validated in Australia (Fisher, Henderson & Fraser, 1997), Singapore (Quek, Wong & Fraser, 2005; Wong & Fraser, 1996) and the United States (Lightburn & Fraser, 2007). Although the SLEI has been found to be valuable for use in a range of different countries, including Australia, its specific focus on the science laboratory, made it unsuitable for use in the research program reported in this thesis.

2.4.2.8 Constructivist Learning Environment Survey (CLES)

The Constructivist Learning Environment Survey (CLES, Taylor, Fraser & Fisher, 1997) was developed to assess the degree to which a classroom environment is consistent with a constructivist view and to assist to teachers to reflect on their pedagogical assumptions in order reshape their teaching practice. The CLES has five scales (Personal Relevance, Uncertainty, Critical Voice, Shared Control and Student Negotiation) with seven items per scale. Each item is responded to using a five point response format (Almost Never, Seldom, Sometimes, Often and Almost Always).

The CLES has been translated into Korean and validated in Korea (Kim, Fisher & Fraser, 2000). It was translated into Chinese for use in a cross-national study involving Taiwan and Australia (Aldridge, Fraser, Taylor & Chen, 2000) and the same five-factor structure and scale reliabilities were similar across both countries. The CLES has also been successfully used and cross-validated in the United States (Dryden & Fraser, 1996; Johnson & McClure, 2004; Nix, Fraser & Ledbetter, 2005) and was used in a 12-week action research study in South Africa (Aldridge, Fraser & Sebela, 2004).

Like the SLEI, the CLES has been shown to be valid and reliable in a range of countries and when used in different languages. It has also been used in a range of

learning contexts. Close scrutiny of the scales and individual items indicated that one of the five scales, the Personal Relevance scale, was pertinent to the present study.

2.4.2.9 What Is Happening In This Class? (WIHIC)

The What Is Happening In This Class? (WIHIC) survey, developed by Fraser, McRobbie and Fisher (1996), aimed to reflect the current field of learning environments research by accommodating recent developments and issues in classroom learning, such as equity and a focus on student understanding. To do this, the most relevant scales from a range of existing learning environment questionnaires were combined and additional scales developed to accommodate contemporary educational concerns (Fraser et al., 1996). There are two versions of the WIHIC, a personal form and a class form. The class form assesses students' perceptions of the class as a whole, whereas the personal form is worded to elicit the student's perceptions of his or her role in the classroom.

The final version of the WIHIC included 56 items with eight items in each of seven scales including: Student Cohesiveness, Teacher Support, Involvement, Investigation, Task Orientation, Cooperation and Equity. The WIHIC has been found to be consistently reliable and has been validated across several subject areas (including mathematics, science, information communication and technology, English and geography) and in several countries including Indonesia (Wahyudi & Treagust, 2006), Canada (Zandvliet & Fraser, 2005), Australia (Aldridge & Fraser, 2000; Dorman, 2001; 2008), Turkey (Telli, Cakiroglu & den Brok, 2006), India (Koul & Fisher, 2006), New Zealand (Saunders & Fisher, 2006), Singapore (Khoo & Fraser, 2008) and the USA (Allen & Fraser, 2007; Gabler & Fraser, 2007; Martin-Dunlop & Fraser, 2008; Ogbuehi & Fraser, 2007).

Dorman (2003) validated the WIHIC using a cross-national sample of 3980 high school students from Canada, England and Australia. The confirmatory factor analysis supported the seven-scale *a priori* structure of the WIHIC. In addition to this, the use of multi-sample analyses within structural equation modelling also established variant factor structures for the three variables (country, grade level and gender). The findings of this study were important because it established the

'international applicability' of the WIHIC as a valid and reliable measure of classroom environment.

Given the strong reliability of the instrument and the applicability of many of the scales to the research program reported in this thesis, the WIHIC was drawn on in the development of one of the instruments (see Chapter 4). Five scales were drawn from the WIHIC for the development of the new instrument, these being: Task Orientation; Cooperation; Teacher Support and Equity.

2.4.2.10 Technology-Rich Outcomes-Focused Learning Environment Inventory (TROFLEI)

The Technology-Rich Outcomes-Focused Learning Environment Inventory (TROFLEI) built upon and extended existing learning environment instruments. It used the WIHIC as the basis for developing an instrument that focused on the use of technology in senior secondary classrooms. Research using the TROFLEI (Aldridge & Fraser, 2008, 2011a, 2011b; Dorman & Fraser, 2009) sought to incorporate classroom environment, its antecedents and student affective outcomes in one study.

The TROFLEI consists of 80 items assigned to 10 scales (eight items per scale), these being: Student Cohesiveness, Teacher Support, Involvement, Task Orientation, Investigation, Cooperation, Equity, Differentiation, Computer Usage and Young Adult Ethos. Seven of these scales were derived from the WIHIC (Aldridge & Fraser, 2003).

Like the CES and ICEQ, the TROFLEI comes in two forms. The actual form, which assesses students' perceptions of their actual class environment and the preferred form, which asks students to indicate, for each item, their preferred or ideal class environment. The questionnaire utilises a side-by-side response format which enables students to record their views of their actual and preferred learning environment, each using a five-point response format of Almost Never, Seldom, Sometimes, Often and Almost Always.

The TROFLEI was validated using multitrait-multimethod (MTMM) modelling within a confirmatory factor analysis (CFA) framework with a sample of 2317 students in 166 classes from one senior secondary school in Western Australia (Aldridge, Dorman & Fraser, 2004; Aldridge & Fraser, 2008). The TROFLEI was also validated for use in New Zealand in a study with a sample of 1027 students from 30 science classes in a New Zealand high school (Koul, Fisher & Shaw, 2011) which sought to investigate possible associations between science classroom environment, attitude and self-efficacy (Koul et al., 2011). The TROFLEI and the WIHIC was drawn on especially during the development of the instrument used to assess students' perceptions of the classroom learning environment which was developed for use in this study.

2.4.3 Research in the Field of Learning Environments

Within the field of learning environments, at least six lines of research have been delineated by Fraser (2007, 2012), these being: a) associations between student outcomes and environment; b) evaluations of educational innovations; c) differences between student and teacher perceptions of actual and preferred environments; d) determinants of classroom environment; e) use of qualitative research methods and; f) cross-national studies. Of relevance to my study was research related to the use of student perceptual measures to guide improvements in the learning environment. This section, therefore, describes a number of studies that are relevant to this line of research.

A number of studies have shown how teachers successfully used feedback, based on students' perceptions, to improve the learning environment (Aldridge & Fraser, 2008; Aldridge, Fraser & Sebela, 2004; Fraser & Fisher, 1986; Sinclair & Fraser, 2002; Thorpe, Burden & Fraser, 1994; Yarrow, Millwater & Fraser, 1997). A defining feature of past learning environments research is that it has aimed to provide a means of obtaining students' perceptions of their classroom and its functionality in their learning. This research has focused largely on investigating the predictive ability of students' cognitive and attitudinal outcomes based on students' perceptions of the classroom learning environment. Learning environments research undertaken

in a large number of countries including United States, Australia, Canada, Israel and India has found that students' perceptions of their learning environment is a strong predictor of learning outcome variance beyond that of other factors including student entry characteristics and ability (Fraser, 2012). Another defining feature of learning environments research has been the emergence of a variety of approaches and methods ranging from those described as purely quantitative or qualitative and more recently those which combine quantitative and qualitative methods (Fraser, 2007; UNESCO, 2012).

Fraser and Fisher (1986) described how teachers have used student perception data to obtain valuable feedback about their teaching performance which has been supported by other studies that have shown how teachers can successfully use student feedback about their actual and preferred learning environments to guide improvements to their classrooms (Aldridge & Fraser, 2008; Aldridge, Fraser & Sebela, 2004; Fraser & Fisher, 1986; Sinclair & Fraser, 2002; Thorpe et al., 1994; Yarrow et al., 1997)

Sinclair and Fraser (2002) utilised a version of the WIHIC as part of an action research process in science classrooms in the United States. Their findings which utilised a sample of 745 middle-school science students in 43 classes, highlighted differences in students' perceptions due to gender and described the activities of one teacher who devised different intervention strategies to better cater for gender differences. The modest improvements indicated that using student perception data is useful for teachers wanting to make improvements to their classrooms.

Yarrow, Millwater and Fraser (1997) utilised action research aimed at improving university learning environments for pre-service teacher education students and at the same time engaged these students in a similar action research process with their own (primary school) classes whom were surveyed using the MCI (described above). The CUCEI was administered to 117 pre-service teachers in university classes. This data was used to introduce and inform pre-service teachers about the field of learning environments, the importance of obtaining valid feedback and ways to use the data as part of action research for improvement. Yarrow, Millwater and Fraser (1997) reported on a number of specific case studies which demonstrated teachers using

student perception data as part of the change process within two learning contexts, utilising two instruments, the MCI and the CUCEI.

Aldridge and Fraser (2008) discussed how data generated from the TROFLEI was used by teachers to help guide their improvements to the classroom learning environment. For each class, nominated by the teacher, the average item mean was calculated for each scale and a profile generated using these scale means. Teachers were encouraged to reflect on their class profile and to identify a scale or scales for greater focus. Teachers then designed and implemented strategies to be employed during an intervention period. After the intervention period, the TROFLEI was re-administered and teachers were presented with a post-test profile which they could use to gauge the success of their intervention. The approach used by Aldridge and Fraser (2008) which involved teachers using the student perception data for reflection and change was also adopted for use in the present study.

2.5 STUDENTS' ATTITUDES AND SELF-BELIEFS

A strong theme in past learning environment research has involved investigations into associations between students' cognitive and affective learning outcomes and their perceptions of the classroom learning environment (den Brok et al., 2006; Fraser & Fisher, 1982; McRobbie & Fraser, 1993). Past research has also shown that the learning environment can be a strong predictor of student attitudes and self-efficacy beliefs (Dorman, 2001; Fraser, 2007, 2012; Walker, 2006) although these affective outcomes are often overlooked in preference to cognitive outcomes, most commonly demonstrated through student achievement data.

The relationship between student cognitive and affective outcomes and students' perceptions of their classroom environment has been investigated in many studies at the primary, secondary and tertiary levels (Fraser & Fisher, 1982; Fraser & Treagust, 1986; McRobbie & Fraser, 1993). A review of literature involving only science classes, by Fraser (1994), highlighted the large variety of samples crossing countries and grade levels and which illustrated an array of cognitive and affective outcomes including achievement, attitudes, satisfaction, inquiry skills, enjoyment and anxiety, that have been measured (Fraser, 1994).

Given the strong relationship between the learning environment and students' affective outcomes (Telli et al., 2006; Wong et al., 1997; Zandvliet & Fraser, 2004, 2005), student attitudes towards their schooling and self-efficacy beliefs could have important implications for improving learning environments and academic outcomes (Lorsbach & Jinks, 1999). When considering the types of information that teachers would find useful for reflection purposes and which could be used to identify areas for change, it was felt that data related to students' attitudes and their self-beliefs would provide teachers with a more complete picture of their student's views. To help achieve this, the second instrument developed for this study was designed to assess students' attitude to subject and belief in their ability to do well in a particular subject (academic self-efficacy beliefs).

2.5.1 Assessing Students' Attitudes

In the past, the study of students' affective outcomes has been difficult to define, and terms commonly used in this area, such as 'interests' or 'attitudes', have often been used loosely and without clarification. Given that an attitude is a non-observable psychological construct whose presence can only be deduced from the behaviour manifested, it is thus not surprising that there is no unanimous agreement amongst social scientists on any given definition for the term.

Attitudes have been described as the "sum total of a man's inclination and feelings, prejudices and bias, preconceived notions, ideas, fears, threats and conviction about any specified topic" (Thurstone, 1928 p. 531); "a mental or neural state of readiness" (Allport & Hartman, 1935, p. 810) or "the cover response evoked by a value" (Linton, 1945, pp. 111-112). According to Mueller (1986), because attitudes cannot be easily observed or measured directly, often their existence must be inferred from their consequences, often deduced by a person's behaviour. Generally, the term attitudes may be used to describe a wide variety of affective behaviours.

Over many years, there have been many instruments developed to measure attitudes which have included Likert scaling, Thurstone scaling and the Guttman scale. However, Kind, Jones and Barmby (2007), drawing on the work of Munby (1983, 1997) and Osborne, Simon and Collins (2003), identified a large number of long-

standing problems with past attitude scales. Some of these problems included the lack of clarity in the descriptions, combining conceptually different ideas to form one uni-dimensional scale and low reliability of the measurement.

One of the scales from the Test of Science-Related Attitudes (TOSRA) developed by Fraser (1979, 1981), which was adapted for use in this research program, is one instrument which overcomes some of the problems previously identified by Kind et al., (2007) and Munby (1997). The TOSRA (Fraser, 1981), provides seven distinct scales based on Klopfer's (1971) classification of students' attitudinal aims. The seven scales: Social Implications of Science; Normality of Scientists, Attitude to Scientific Inquiry, Adoption of Scientific Attitudes, Enjoyment of Science Lessons, Leisure Interest in Science, and Career Interest in Science. Each scale was comprised of 10 items, making a total of 70 items in the TOSRA and was developed for use with secondary high school students.

The TOSRA has been cross-validated in several different countries. Fraser, Aldridge and Adolphe (2010) used the original version of the TOSRA to assess and compare students' attitudes to science in two contexts, Australia and Indonesia in a sample consisting of 1161 students (594 students from 18 classes in Indonesia and 567 students from 18 classes in Australia). Modified versions of the TOSRA have also emerged. Wong and Fraser (1996) used a modified version of TOSRA, called the Questionnaire on Chemistry-Related Attitudes (QOCRA), to assess students' attitudes towards chemistry in laboratory classrooms with a sample of 1592 secondary school students in 56 classes in 28 schools in Singapore. The QOCRA is a shortened and modified version of the TOSRA in which the word 'science' has been replaced with 'chemistry' and the word 'test' replaced with the word 'questionnaire' with all other wording of items remaining the same as with the original version.

Some studies have used one or more scales of the TOSRA. Riah and Fraser (1998) used one scale of the TOSRA, Enjoyment of Science Lessons, to assess students' attitudes in a sample of 644 chemistry students from 35 classes in 23 secondary schools in Brunei Darussalam. Wolf and Fraser (2008) also used the same single TOSRA scale to assess students' attitudes in 1434 students in 71 classes in New

York, and Khine and Fisher (2002) used the QTI, the WIHIC and two scales of the TOSRA, namely, Enjoyment of Science Lessons and Attitudes to Scientific Inquiry to examine science classrooms and attitudes in Brunei in a sample comprised of 1188 students from 54 classes in 10 government secondary schools. Statistical analyses of the data for each of these studies have supported the validity and reliability of individual scales of the TOSRA.

One scale, Enjoyment of Science Lessons, which was adapted for use in the TROFLEI (Aldridge & Fraser, 2008) and renamed Attitude to Subject was considered to be particularly pertinent to the research program. This scale was modified and was used to provide teachers with data about students' attitudes towards a particular subject. Further discussion of this scale and its development is included in Chapter 4.

2.5.2 Assessing Students' Self-Efficacy Beliefs

Academic efficacy draws from the field of research related to self-efficacy, a central component of Bandura's (1977) social cognitive theory. Self-efficacy refers specifically to the extent to which a student is confident in his or her ability in a particular domain. According to Bandura (1986), self-efficacy refers to a sense of confidence or the belief that an individual possesses about their performance and "is concerned not with the skills one has but with the judgments of what one can do with whatever skills one possesses" (Bandura, 1986, p. 391). Research has shown that a link exists between self-efficacy and academic performance (Jinks & Morgan, 1999; Multon, Brown & Lent, 1991; Schunk, 1981, 1982, 1983, 1989) and there are further suggestions that a reciprocal relationship exists between academic efficacy, motivation and effort, where motivation and effort are influenced by a student's academic efficacy beliefs and vice versa (Schunk, 1996).

According to Jinks and Morgan (1999) and Schunk (1991), academic self-efficacy refers to the confidence an individual possesses to successfully complete an academic task or achieve academic success. Individuals with high academic self-efficacy approach difficult or challenging tasks willingly and with confidence (Pajares, 1996; Schunk, 1991; Schunk & Zimmerman, 1997) and are more likely to

persist with a task (Pajares, 1996), whereas individuals with low academic self-efficacy tend to give up and do not persist with tasks if they perceive that they are unlikely to achieve success (Schunk, 1994). High academic self-efficacy can positively influence student engagement, effort, goal setting and performance (Bandura, 1982, 1989; Schunk, 1989; Zimmerman, Bandura & Martinz-Pons, 1992). In addition, Schunk (1996) suggests that there exists a reciprocal relationship between academic self-efficacy, motivation and effort, whereby motivation and effort influence, and are influenced by an individual's academic self-efficacy.

Students with high levels of academic self-efficacy are more likely to put in the required effort, use a range of learning strategies and implement strategies which assist them to evaluate and self-regulate their learning (Pajares, 1996; Schunk, 1989; Schunk & Pajares, 2005). While students with high academic self-efficacy are more likely to try different strategies and persist with a task, according to Jinks and Morgan (1999), outcome expectations can also influence student motivation. They suggest that a student who is generally confident and able in a particular area may not engage well if they feel that the teacher dislikes them. It follows then, that student perceptions about their learning environment and academic self-efficacy are critical elements to student engagement and motivation in the classroom.

According to Dorman, Fisher and Waldrip (2006) and Velayutham, Aldridge and Fraser (2011), sources of self-efficacy can be attributed to the psychosocial learning environment and underlying the research reported here is the view that students' self-efficacy beliefs, regarding their academic performance, could have important implications for improving learning environments and student achievement. There have been a number of instruments which have used self-report measures to assess self-efficacy, some of which focused on older students and adults (Gibson & Dembo, 1984; Gorrell & Partridge 1985; Gorrell & Capron, 1988, 1989). Pintrich and DeGroot (1990) used data collected from a self-report to measure student motivation in younger students, referring to self-efficacy as 'motivational belief'.

In investigating this link, the Academic Efficacy scale, developed by Aldridge and Fraser (2008) and based on the Morgan-Jinks Student Efficacy Scale (MJSES; Jinks

& Morgan, 1999), was used to investigate the associations between student perceptions about their competence and their perceptions of the learning environment. The Morgan-Jinks Student Efficacy Scale (MJSES; Jinks & Morgan, 1999) is an inventory designed to gain information about student self-efficacy beliefs which relate to school success. The final version of the MJSES was comprised of 30 items plus four items requesting grade performance was administered to approximately 570 students across two school sites in the United States. It utilised a Likert-response scale with a four point response alternatives of Really Agree, Kind of Agree, Kind of Disagree and Really Disagree. The decision to use more informal language in the descriptors was to ensure that the choices were more appropriate to the age of the children being surveyed and to align more closely to their language patterns and usage. This approach is similar to other studies where surveys designed for school-aged children have utilised informal language to better enable students to ascertain the meaning of survey items clearly and consistently (Schunk, 1981).

The MJSES aimed to provide educators with an insight into student perceptions of their self-efficacy beliefs in relation to their academic performance. In field testing, the scale has been shown to be reliable and correlated positively with academic achievement. Early research using the MJSES suggested a relationship between self-efficacy beliefs and motivation and sustained efforts to improve students' self-efficacy beliefs could have an indirect effect on academic performance (Morgan-Jinks, 1999). This finding is consistent with other research which suggests that a significant link exists between academic performance and academic self-efficacy beliefs (Pajares, 1996, 2007; Bandura, Barbaranelli, Caprara & Pastorelli, 1996).

The MJSES was used to develop one scale for the TROFLEI (Aldridge & Fraser, 2008). The resulting scale, Academic Efficacy, was used to investigate the associations between student perceptions about their competence and their perceptions of the classroom learning environment. This scale was considered to be relevant to this research program and was modified further to provide teachers with data about students' belief in their ability to succeed in a particular subject. Further discussion of this scale and its development is included in Chapter 4.

2.6 CHAPTER SUMMARY

This chapter provides a summary of the literature related to the key research areas which form the basis of the research reported in the present study, namely, school improvement and effectiveness, teacher development, the field of learning environments, students' attitudes and self-efficacy beliefs.

While having positive classroom environments should be a valuable goal of education and past research provides compelling evidence that the classroom environment so strongly influences student outcomes that it should not be ignored by those wishing to improve the effectiveness of schools (Fisher & Khine, 2006; Fraser, 2007, 2012; McRobbie & Fraser, 1993). Given that there were a number of schools who purposefully linked activities undertaken by their teachers to initiatives for school-level improvement, the first section reviewed literature related to school improvement.

The field of school improvement and effectiveness is a relatively new research area which has shown that teachers can and do make a difference. This body of research highlights the need to focus on improving teacher quality in order to improve the learning outcomes of students in schools. More recent research in this area has highlighted the role of the teacher as the key driver in school reform and the need for school improvement efforts which seek to improve teacher quality to recognise the potential of teachers and their impact on student learning, school culture, school improvement processes and school effectiveness.

These findings have led to a renewed emphasis on teacher quality which has, most typically, been translated in practice through teacher development programs aimed at bringing about sustained and significant change at the classroom and school level. This body of research highlights the need for sustained efforts by schools as organisations to build a school culture which supports and fosters effective school processes, which result in existence of a shared commitment to school improvement and willingness of members of the school community to become a learning organisation that employs reflective practices at all levels and utilises new models of

leadership which seek to empower and build the capacity of teachers within that organisation.

Despite little empirical evidence to suggest a direct link between teacher professional development and improved student outcomes, the literature argues that any positive change in teacher practices are likely to improve student learning outcomes. Research related to school effectiveness and school improvement shows strong links between teacher development and school improvement, which has led to a renewed emphasis on focused, systematic teacher development as a means to improve teacher quality and student outcomes.

Given the importance of improving teacher quality through teacher development activities (a focus of the present study) this chapter reviewed literature related to the conditions which best support teacher development. While earlier studies identified those factors which best facilitate teacher learning, contemporary research, drawing on empirical evidence, has established a link between effective teacher development and improved teacher effectiveness, which is consistent with earlier research. It appears that, although one form of professional development is not considered to be better than the other, activities which provide the greatest opportunity for professional learning and growth of teachers are those which are: on-going, occur over time and connected to practice; focused on student learning and specific teaching content; link with school goals and priorities and aim to build strong relations among teachers by providing opportunities for collaboration.

Action research has been described as a self-reflective and systematic form of inquiry which is used to improve the practices and understanding of practices of those in education settings and has proven to be a popular form of professional development in schools. Increasingly, teacher action research is seen as an effective way to support the development and professional growth of teachers. Teacher action research is teacher driven and involves the teacher taking on the role of researcher, providing them with opportunities to use evidence linked directly to their classroom contexts to examine ways to improve teaching and learning.

Importantly, past studies have shown that teacher action research can have a direct impact on student outcomes, classroom practices and teacher behaviours and can indirectly influence the performance of others. 'Practical' teacher action research as opposed to 'participatory' action research, used in the present study, focuses on teachers using professional judgements on the best way to improve their teaching based on systematic individual or team-based inquiry which is evidence-based and clearly focused on teacher development and professional growth.

Teacher action research is a popular tool for professional development because it is characterised by a spiral of critical, self-critical and reflective processes and is seen to foster in teachers, reflective practices. Originating with the work of Dewey (1916, 1933) and subsequently expanded on by Schön (1983, 1987), Van Manen (1977, 1995), Korthagen (2001) and Jay and Johnson (2002), reflective practice is considered to be central to one's practice as a teacher. Most researchers agree that reflection is a purposeful act made up of a number of stages. At the simplest level, these reflections are described as practical and focused on the very act of teaching. More complex reflections are characterised by critical or possibly moral reflections which have transformational effects on one's practice and behaviours. According to the literature, reflection is essential to sustaining teacher effectiveness and, activities aimed to develop teachers, should provide opportunities for teachers to reflect critically in order to form new understandings and perspectives about their practices, pedagogy, students learning and content.

Teacher action research using student perception data as the basis for reflection and to help to guide modifications to the classroom learning environment has been used successfully in a number of past studies and is considered an effective way to support teacher professional growth because it: is student-focused and directly linked to the classroom; provides opportunities for collaboration between teachers; draws on past research-based knowledge, is on-going and most importantly, involves teachers actively reflecting on their practice.

As the present study focused on the ways to improve the classroom environment, this chapter also provided an overview of learning environments research and a summary

of 10 instruments which influenced the development of one of the instruments used in the present study.

Early definitions by Fraser (1998) describe the learning environment of a classroom as broadly encompassing all elements and comprised of two parts, the human and the physical environment. In a recent report investigating the vast and diverse body of research related to learning environments (UNESCO, 2012), early definitions of the classroom learning environment have been expanded upon and clarified. This report distinguishes between the terms 'learning environment' as referring to the context in which learning occurs; the 'conditions of learning' as referring to the factors which influence learning within that environment; 'climate' as referring to the atmosphere or tone of the learning space; the term 'culture' to refer to the values and beliefs shared by a particular learning group and the 'organisational' climate of schools to refer to the collective perceptions of those within a particular learning organisation.

Learning environments research is grounded in social cognitive theory which has sought to create optimal learning environments to maximise student learning outcomes and has been shaped significantly by research related to person-environment fit. Historically, learning environments research grew out of the work by Lewin and Murray in the 1930s which was followed by the work of Moos and Walberg in the 1970s. In the last 50 years, a large body of research literature has emerged with has helped conceptualise, evaluate and investigate student and teacher perceptions of psychosocial dimensions of the learning environment.

Learning environments research has shown that students' perceptions of their learning environment are strong determinants of student outcomes and has established links between student's cognitive and attitudinal outcomes. Learning environments research has also resulted in a suite of instruments with wide applicability which can be modified to suit the nature of an investigation, many of which have utilised a variety of approaches and research methods.

Lastly, this chapter reviewed literature related to students' attitudes and academic self-efficacy beliefs. Past research has shown strong associations between student affective outcomes and students' perceptions of their classroom environment. Given

this, any attempts to improve classroom environments should also consider students' views about their learning and belief in their ability to succeed in that environment.

CHAPTER 3

RESEARCH METHODS

3.1 INTRODUCTION

Initially, the research presented in this thesis focused on the transformation of senior secondary classroom learning environments to ones which were more constructivist in nature. Over the course of the research, however, the focus shifted towards the role that the teacher plays in creating dynamic and effective learning environments and the ways in which student feedback could be used to provide teachers with information with which they could reflect on their practice and implement strategies for improvement.

The research reported in this thesis was comprised of two concurrent and interrelated investigations (detailed in Section 3.2). The first (Part A) investigated the development and validation of two survey instruments, one to assess students' perceptions of their learning environment and the other to assess students' attitudes and academic self-efficacy beliefs, which would provide data for teacher reflection and action. The second (Part B), investigated the ways in which student feedback (collected during Part A) was used by teachers to guide their action research as part of a professional development activity.

This chapter describes the research methods used in the two investigations (Part A and Part B) under the following headings:

- Research Design (Section 3.2);
- Sample (Section 3.3);
- Data Collection (Section 3.4);
- Data Analysis (Section 3.5);

- Ethical Considerations (Section 3.6); and
- Chapter Summary (Section 3.7).

3.2 RESEARCH DESIGN

My research involved the use of a multi-method design to provide a more comprehensive picture of the problem under investigation than would be possible using one method alone. Morse (2003, p. 189) explains that:

> By combining and increasing the number of research strategies used within a particular project, we are able to broaden the dimensions and hence the scope of our project. By using more than one method within a research program, we are able to obtain a more complete picture of human behaviour and experience.

It was envisaged that the use of different methods, as opposed to a single method, would provide broader perspectives (Morse, 1991) and allow for the examination of different levels or aspects within the study (Tashakkori & Teddlie, 1998). The two complete, interrelated investigations (Part A and B) were conducted simultaneously and can be represented by:

QUAN + qual

This notation reflects a research design in which quantitative and qualitative methods were employed simultaneously characterised primarily by a deductive theoretical drive (Morse, 2003). In this case, the quantitative data, collected using two surveys, was central to the two investigations within the one research program.

The theoretical drive for Part A was deductive with a post-positivist worldview (Smith & Lovat, 1991). Part A used quantitative research methods to investigate the reliability and validity of the two surveys as well as pre–post changes to the learning environment to evaluate the effectiveness of the teachers' action research activities.

In contrast, Part B was inductive, involving an interpretivist worldview (Morse, 2003). Part B involved a qualitative approach to data collection and analysis to

investigate the ways in which teachers used the student feedback (based on students' perceptions of the classroom learning environment, their attitudes and academic self-efficacy beliefs) to reflect, plan and implement strategies to improve their classroom learning environments. As well, Part B investigated the possible value of this approach for teacher professional development and school improvement.

In contrast to earlier learning environment research, which has utilised a mixed method approach (Fraser, 2012; UNESCO, 2012), the research design employed in this research program involved a 'multistrand design' (Tashakkori & Teddlie, 2003), similar to the multimethod design pioneered by Campbell and Fiske (1959) and the multitrait-multimethod matrix developed by Tashakkori and Teddlie (2003). An overview of the research design and the interrelatedness between the two investigations is depicted in Figure 3.1 which shows that there are three areas in which the two investigations are interrelated. The first area of interrelatedness involves the utilisation of quantitative data, collected in Part A, as the driver for teacher action research in Part B of the research program. The second occurs at the data analysis phase, where the inferences, generated from each set of data, are compared and contrasted. These are then used to inform the overall findings from the research program (the third area of interrelatedness).

3.3 SAMPLE

The research program reported in this thesis utilised different 'grain sizes' (Fraser, 1999) for collecting and analysing data over the three-year period. For the purpose of this study, the different grain sizes that were used to address the research questions are depicted below in Figure 3.2 and described using the following headings: Whole Sample: Large-Scale Survey Administration (Section 3.3.1); Pre−Post Sample (Section 3.3.2); Focus Group: Focus Teachers and Schools (Section 3.3.3); Teacher Evaluation Group (Section 3.3.4); and Critical Instance Case Study (Section 3.3.5).

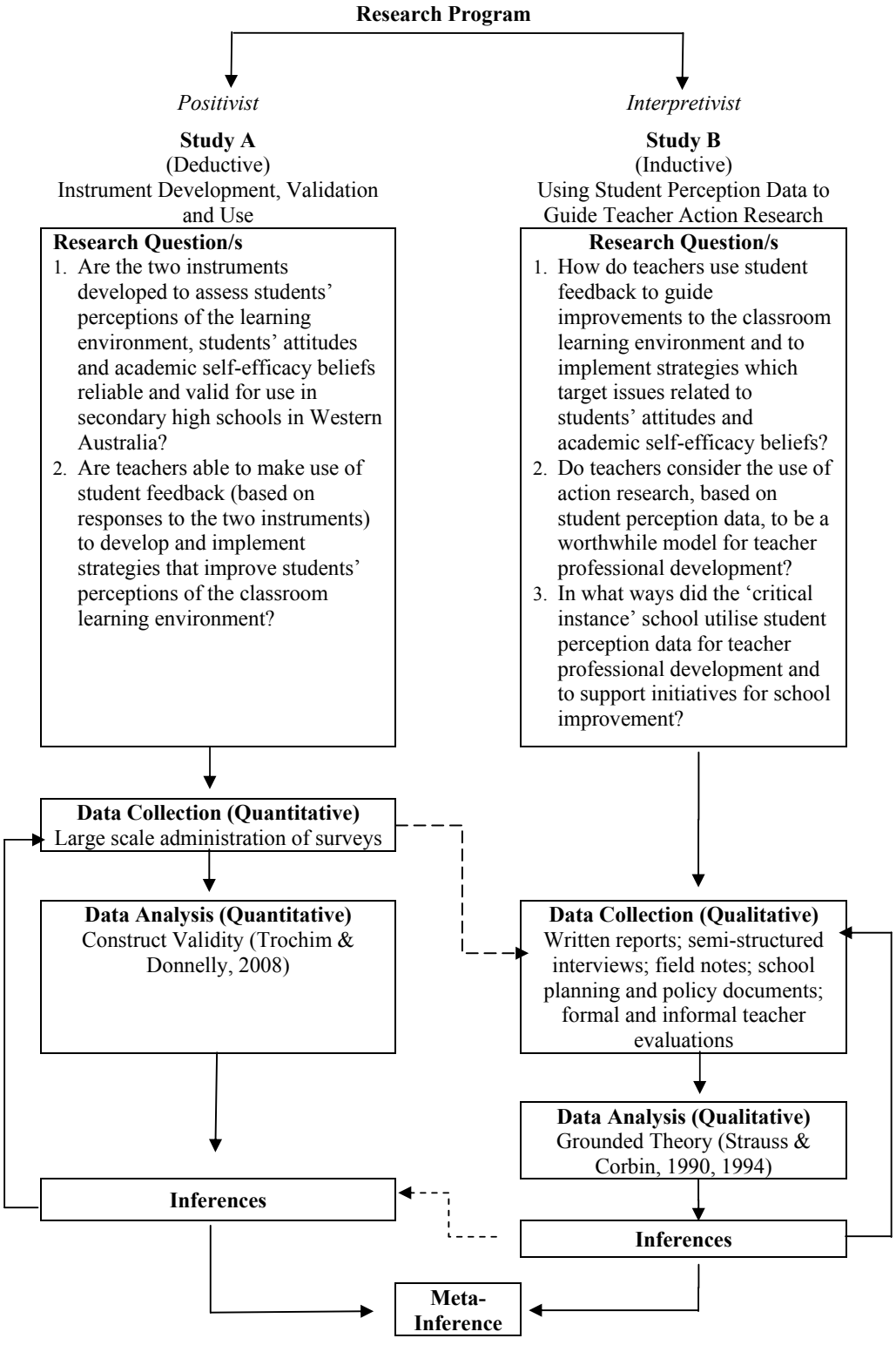


Figure 3.1 Overview of the research program showing areas of interrelatedness

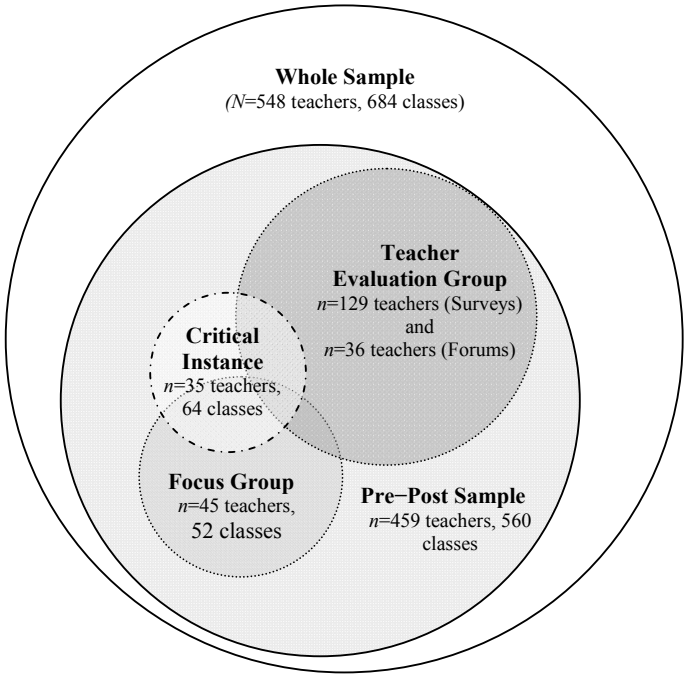


Figure 3.2 The different 'grain sizes' used in the research program

3.3.1 Whole Sample: Large-Scale Survey Administration

While the involvement of teachers and schools was voluntary, to ensure external validity and generalisability of the results (Trochim & Donnelly, 2008), it was considered important that a range of schools were involved in the research. Purposeful sampling was used to ensure that a mix of government and non-government schools; and rural and metropolitan schools across a range of socio-economic areas were included. Initially, 50 schools were approached to take part in the research and, of this number, nine became involved in the first year (a number which grew in subsequent years). In total, 29 co-educational schools were involved in the research program over the three-year period. The majority of the schools became involved in the research as a result of the interest of the school principal; however, in some cases, involvement was initiated by individual teachers or small groups of teachers. Of the 29 schools, four were located in regional areas of Western Australia and the remainder were located in the Perth metropolitan area.

Information provided by the Australian Curriculum and Assessment Authority (ACARA), through the *My Schools* website, provides profiles and performance data on schools in Australia (ACARA, 2012a). The Index of Community Socio-Educational Advantage (ICSEA) uses the key attributes of a school's student population to enable meaningful comparisons to be made across schools (ACARA, 2012b). The index includes student-level data (including occupation and education level of parents or carers) and/or socio-economic characteristics of areas where students live (for example whether schools are located in a metropolitan, rural or remote area and the proportion of indigenous students etc.) Most schools have an ICSEA of between 900 and 1100 and, generally, those schools with an ICSEA of less than 1000 are considered to be less advantaged whilst those with an ICSEA above 1000 are considered to be more advantaged (ACARA, 2012b). This website was used to identify the types of schools that were involved in the research. The sample included schools with a range of ICSEA values. Of the 29 schools involved over the three years, 14 had an ICSEA value below 1000, with one school having an ICSEA value below 900. The remaining 15 schools had an ICSEA value above 1000, with three of these schools having an ICSEA value greater than 1100.

From these 29 schools, a total of 548 teachers (107 teachers in 2008, 247 teachers in 2009 and 194 teachers in 2010) participated in the research over the three years. These teachers ranged in age and teaching experience (number of years). As no learning area was specifically targeted, the sample was comprised of the full range of learning areas in Western Australian schools and included teachers and students drawn from English, Science, Mathematics, Society and Environment, Technology and Enterprise, The Arts and Languages Other Than English (LOTE).

Table 3.1 provides an overview of the sample showing the number of teachers, classes, student response and schools used in the research over the three-year period. More detailed information about the number of teachers and classes per school, per year can be found in Appendix B. At the largest grain size, this sample of 10,345 student responses in 684 classes was used, primarily, to investigate the validity and reliability of the two instruments developed for the research program.

Table 3.1 Overview of the whole sample showing the number of teachers, classes, student responses and schools over the three-year period

Year	Number of Teachers	Number of Classes	Number of Student Responses	Number of Schools
2008	107	147	2042	9
2009	247	298	4467	25
2010	194	239	3836	21
TOTAL	548	684	10,345	29*

*As a number of the schools were involved in more than one year, this number indicates the total number of individual schools involved in the research over the three-year period.

3.3.2 Pre−Post Sample

Of the 548 teachers involved in the whole sample (described in the previous section), 459 teachers (some of whom selected more than one class) volunteered to be involved in the pre−post component. The pre−post sample was used to address the second research question which sought to investigate whether teachers were able to make use of student feedback to improve the classroom learning environment. The pre−post sample was also used as an indication of the extent to which improvements were made at the classroom- and school-level.

In contrast to the whole sample (described earlier), which was comprised only of data gathered from the pre-test, the pre−post sample included only the schools in which both the pre-test and post−test data collection took place. While pre−post data was collected from 28 of the 29 schools over the three-year period, the number of schools included in the pre–post sample varied from year to year. The pre−post sample was comprised of all 9 schools in 2008, 23 of the 25 schools involved in 2009 and 19 of the 21 schools involved in 2010.

The pre–post sample included the classes of 459 teachers (91 teachers in 2008, 210 teachers in 2009 and 158 teachers in 2010). In all cases, only the data for those students who were present for both the pre-test and post-test was used. The student sample was comprised of 6107 student responses (1182 student responses in 2008, 2749 student responses in 2009 and 2176 student responses in 2010) in 560 classes (122 classes in 2008, 248 classes in 2009 and 190 classes in 2010). Table 3.2

provides an overview of the pre−post sample and a more detailed overview of the sample (in terms of the number of teachers in each school and classes each year) can be found in Appendix C.

Table 3.2 Overview of the pre–post sample showing the number of teachers, classes, student responses and schools over the three-year period

Year	Number of Teachers	Number of Classes		Number of Student Responses	Number of Schools
	Pre–Post	Pre–Post	Focus Classes	Pre–Post	Pre–Post
2008	91	122	15	1182	9
2009	210	248	15	2749	23
2010	158	190	22	2176	19
TOTAL	459	560	52	6107	28*

*As a number of the schools were involved in more than one year, this number indicates the total number of individual schools who participated in both the pre-test and post-test over the three-year period.

3.3.3 Focus Group: Focus Teachers and Schools

During each year of the study, a group of teachers volunteered to be 'focus teachers'. Over the three-year period, there were a total of 45 focus teachers (12 teachers in 2008, 13 teachers in 2009 and 20 teachers in 2010), who were drawn from seven 'focus' schools, three of which had purposefully linked the action research activities, undertaken by their teachers, to school improvement initiatives.

Teachers at each of these schools were invited to be part of the focus group. Those teachers who volunteered to be involved were monitored more closely than the other teachers and were given opportunities to discuss their activities and approaches with me and their colleagues as they undertook their action research. Each year, at least one focus teacher from each school was randomly selected for a formal interview. Generally the selection of teachers for interviews was determined by time availability.

The classes of the 45 focus teachers were identified as 'focus classes' and were used to investigate whether differences existed between this group and the other teachers involved in the pre−post sample. There were a total of 52 focus classes over the three

years (15 focus classes in 2008, 15 focus classes in 2009 and 22 focus classes in 2010). The role of these teachers and the data collection methods are discussed in Section 3.4.2.

The data collected from focus teachers was used specifically to address the third research question which investigated the ways in which teachers utilised the data as part of an action research process to improve their classroom learning environments and to target issues related to students' attitudes and academic self-efficacy beliefs. Data collected from the focus teachers along with that gathered from the teacher evaluation group (discussed in the next section), was used to address the fourth research question which evaluated the use of teacher action research, based on student feedback, as a model for teacher professional development.

3.3.4 Teacher Evaluation Group

The teacher evaluation group was comprised of teachers, from the pre–post sample, who responded to a teacher evaluation survey and those who participated in the forums at the end of each year. Data collected using the survey and the teacher forums were used to provide feedback about the instruments (Research Question 1); the research process and the activities undertaken by participants (Research Questions 2 and 3); and to gauge the usefulness of the activity for teacher professional development (Research Question 4).

The 459 teachers who were involved in the pre−post component of the study (described above) were all asked to respond to a teacher evaluation survey, which was mailed out, along with the post-test feedback profiles, at the end of each year. Of these teachers, seven teachers (about 8%) responded in 2008, 44 teachers (about 20%) responded in 2009 and 78 teachers (about 50%) responded in 2010. Feedback from participants was also gathered through the teacher forums held at the end of each year; a total of 36 teachers attended these forums (nine teachers in 2008, 14 teachers in 2009 and 13 teachers in 2010).

3.3.5 Critical Instance Case Study

This thesis also reports the efforts of one of the seven focus schools that purposefully targeted professional development using teacher action research as part of an initiative for whole-school improvement. This senior college constituted a 'critical instance' case study, as described by Anderson (1998), and involved the examination of a single instance of unique interest within a larger research program.

This particular school linked the activities related to this research, to their school-based teacher development initiatives which involved me spending more time with the teachers in this school than in other schools. This provided a range of opportunities for me to observe and discuss the research with members of the school leadership team and teachers. In addition, an initial data analysis, carried out towards the end of the first year, showed that a large number of the teachers at the school had utilised strategies and approaches consistent with the whole school initiatives and, overall, there had been general improvements in areas that the school had specifically targeted in their planning. It was for these reasons that this school was selected as a critical instance case study.

The school was relatively new, having opened in 2003, and was located in a new, fast-growing northern suburb of Perth, Western Australia. In 2008, the school had around 700 students (70 teachers) and, by 2010, this number had increased to 840 students (85 teachers). The school was characterised by flexible operating hours which offered students opportunities outside of the classroom through placements at universities, Technical and Further Education Centres (TAFE), community organisations or the workforce. The school had a focus on providing a safe environment that catered for the needs of senior secondary students and which promoted a young adult ethos. It featured a mentor system designed to reinforce family values and to provide care, support and positive guidance to students on an individual basis.

At the school, a total of 729 matched pre–post student responses (192 student responses in 2008, 290 student responses in 2009, 247 student responses in 2010) from 64 classes (18 classes in 2008, 25 classes in 2009 and 21 classes in 2010) were

collected over the three-year period. Table 3.3 provides an overview of the sample for the critical instance school. During the course of research, a total of 35 senior secondary (Grade 11 and 12) teachers were involved, each of who selected one or two classes (comprised of approximately 20 to 25 students). The data collected from their students was used, as part of an action research process, to make improvements to the classroom learning environment. Eight of these teachers (three teachers in 2009 and five teachers in 2010) were part of the focus group, described in Section 3.3.2. Five of these teachers (two in 2009 and three in 2010) were randomly selected for interviews during the action research process.

Table 3.3 Overview of the critical instance case study (pre−post) sample showing the number of teachers, classes and student responses over the three-year period

Year	Number of Teachers	Number of Classes		Number of Student Responses
	Pre−post	Pre−post	Focus Classes	Pre−post
2008	10	18	0	192
2009	17	25	4	290
2010	17	21	5	347
TOTAL	44*	64	52	729

*Nine teachers from the critical instance school participated more than once during the period of research, a total of 35 individual teachers were involved in the research over the three-year period.

3.4 DATA COLLECTION

Section 3.2 reported that the research program was comprised of two concurrent and interrelated studies (referred to as Part A and Part B). This section describes the data collection for each of the studies with respect to: the phases used to collect the data (Section 3.4.1); the collection of quantitative data (Section 3.4.2); and the collection of qualitative data (Section 3.4.3).

3.4.1 Phases of Data Collection

The data collection for each of the two studies (Part A and Part B), involved six phases that were carried out each year of the three-year period. These phases are presented diagrammatically in Figure 3.3 and explained briefly in the ensuing sections.

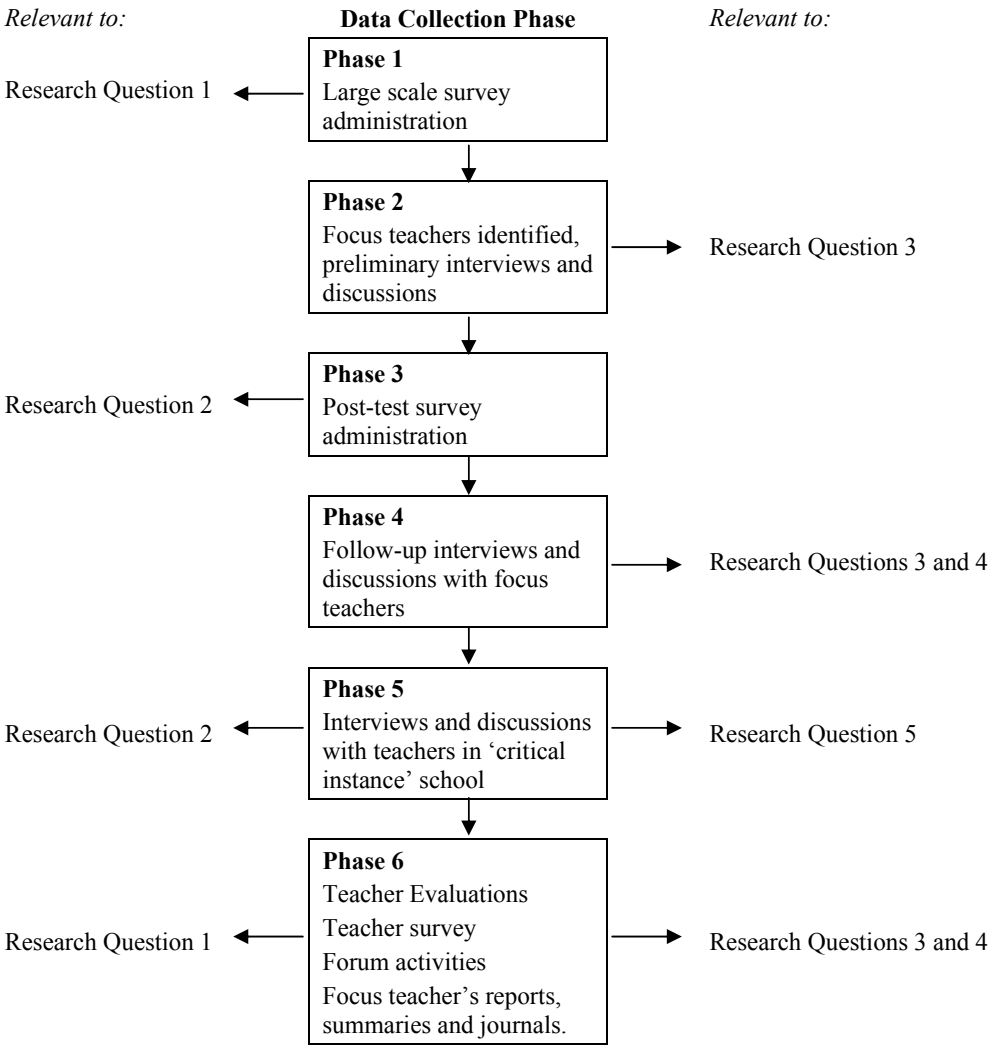


Figure 3.3 Phases of data collection undertaken each year of the three-year period

3.4.1.1 Phase 1

In each year of the study, the two instruments (one to assess students' perceptions of the learning environment and the other to assess students' attitudes and academic self-efficacy beliefs) were administered to classes that were nominated by the participating teachers.

To ensure that students understood the purpose of the activity and what was required, the following information was conveyed to students:

1. This is not a test. Your teacher is interested in your views about what goes on in the classroom and would like your feedback.
2. The survey is confidential and your teacher will not know how you responded as an individual but will see an overall class result (average). It is important that you give fair and considered feedback.
3. The survey is comprised of a number of items, you need to read each item carefully and indicate a response according to your view. There are two columns, the first column, ACTUAL, is asking you to indicate your view on how things currently are in the classroom and the second column, PREFERRED, is like a wish list – it is asking you to indicate your view on how you would like it to be. If you are happy with how the classroom operates for a particular statement, you would put the same response for actual and preferred.
4. It is important for you to be honest. Your teacher values your feedback and will use the information to decide what changes could be made to improve the classroom for your benefit.

Feedback, based on this pre-test data, was given to teachers in the form of a teacher feedback package that provided a range of information upon which teachers could use for the purpose of reflection and to plan strategies for implementation. Details pertaining to the teacher feedback packages and the types of data provided to teachers were described briefly in Chapter 1 (Section 1.4).

3.4.1.2 Phase 2

During phase 2 of the data collection, the teachers at each of the schools were invited to take part in the research on a more formal basis. These teachers were identified as focus teachers. Semi-structured interviews were held with each of these teachers (either individually or in small groups) which focused on their motivation for taking part in the study, their initial responses to their data; preliminary ideas for change and possible course of action and demographic information (name, learning area and number of years of teaching experience). Data collected at this phase was used to

address Research Question 3 which sought to investigate the ways that teachers used student feedback as part of an action research process.

3.4.1.3 Phase 3

Phase 3 of the data collection occurred after an intervention period of between 6 to 8 weeks, during which teachers were given the opportunity to implement their improvement strategies. During this phase, the two instruments (administered during phase 1) were re-administered to the same classes and students. The post-test data was provided to teachers as a feedback package, which could be used to ascertain the extent of any change resulting from their planned intervention (This post-test feedback is described in Section 1.4.5). This post-test data was used to investigate pre–post changes and to address Research Question 2, which sought to investigate whether students' perceptions changed as a result of their activities. Data collected during this phase was also used to assess the extent to which changes occurred at the critical instance school.

3.4.1.4 Phase 4

Once the post-test feedback had been provided to teachers, semi-structured interviews were held with teachers in the focus group. Depending on teacher availability, some interviews were conducted in small groups or with individual teachers. Due to limited availability, a number of follow-up interviews were conducted over the telephone. Along with data collected at phase 2, this data helped to address Research Questions 3 and 4.

3.4.1.5 Phase 5

The critical instance school was identified in the first year of the study. At the end of the first year, I decided to monitor the activities at this school a little more closely. In 2009 and 2010, a range of data was collected from this school, including a range of school and policy documents and semi-structured interviews held with members of the school leadership team and focus teachers. Data collected at this phase along with earlier data collected from focus teachers during phase 2, was used to address

Research Question 5 which sought to investigate how the school used student perception data to support initiatives for school improvement.

3.4.1.6 Phase 6

During the final phase of data collection, evaluations were sought from all teachers involved in the study. Teachers were asked to complete a survey to help to evaluate the two instruments and the teacher feedback packages and to examine the extent to which they felt their participation in the action research activity contributed to their professional development. The quantitative data collected from the teacher survey were used to address Research Questions 1, 3 and 4.

Data was also collected from focus teachers at a forum held at the end of each year along with their written reports, summaries and reflective journals. In the first year of the study, evaluative feedback was also sought from students and a group of 'expert' teachers which was used to refine the two instruments and to ensure good construct validity (Research Question 1).

The following sections describe the data collection undertaken at each phase of the research program. The quantitative data collection (undertaken at phases 1, 3 and 6) is described in Section 3.4.2 and the qualitative data collection (undertaken at phases 2, 4, 5 and 6) is described in Section 3.4.3.

3.4.2 Quantitative Data Collection

A detailed description of the instruments and the theoretical basis for the inclusion of individual scales is provided in Chapter 4. Therefore, this section provides only an overview of the three instruments used to collect data for the quantitative component of the study (Phases 1, 3, and 6), these being: the Constructivist-Oriented Learning Environment Survey, to assess students' perceptions of the learning environment (described in Section 3.4.2.1); the Attitudes and Self-Belief Survey, to assess students' attitudes and academic self-efficacy beliefs (described in Section 3.4.2.2.); and the Teacher Evaluation Survey, to gather evaluative feedback from participating teachers (described in Section 3.4.2.3).

3.4.2.1 Students' Perceptions of the Learning Environment

The Constructivist-Oriented Learning Environment Survey (COLES) was developed to assess students' perceptions of the classroom learning environment and is comprised of 11 scales, that can be grouped into three broad categories: Relationships (which includes the scales of Student Cohesiveness, Teacher Support, Equity and Young Adult Ethos); Assessment (which includes the scales of Clarity of Assessment Criteria and Formative Assessment); and Delivery (which includes the scales of Task Orientation, Differentiation, Personal Relevance, Involvement, and Cooperation). Table 3.4 provides a description and sample item for each COLES scale.

Each of the scales had six items, with the exception of one (Young Adult Ethos), which had seven items, providing a total of 67 items. Students responded to the items using a five-point frequency scale of Almost Always, Often, Sometimes, Seldom and Almost Never. Importantly, this instrument enabled students to provide information about the learning environment that was present in the classroom (the *actual* environment) as well as information about the learning environment that they would like (their *preferred* environment). To achieve this, the instrument made use of a side-by-side response format, used successfully in previous research, in which students were able to respond to each item with respect to both their actual and preferred responses (Aldridge & Fraser, 2011a, 2011b). Figure 3.4 provides an example item showing the side-by-side format used in the COLES. A more detailed description of the development of the COLES and the theoretical basis for the inclusion of individual scales is provided in Chapter 4. The scales and items for the COLES can be found in Appendix D.

Table 3.4 Description and sample item for each COLES scale

	Scale	Description	Sample Item
		The extent to which …	
RELATIONSHIPS	Student Cohesiveness	…students know, help and are supportive of one another.	*Members of this class are my friends.*
	Teacher Support	…the teacher helps, befriends, trusts and is interested in students.	*The teacher moves around the class to talk with me.*
	Equity	…students are treated equally by the teacher.	*I get the same amount of help from the teacher as do other students.*
	Young Adult Ethos	…teachers give students responsibility and treat them as young adults.	*I am given the opportunity to be independent.*
ASSESSMENT	Formative Assessment	…students feel that the assessment tasks given to them make a positive contribution to their learning.	*Assessment tasks help me to monitor my learning.*
	Clarity of Assessment Criteria	… the assessment criteria are explicit so that the basis for judgments is clear and public.	*I understand how the teacher judges my work.*
DELIVERY	Involvement	…students have attentive interest, participate in discussions, ask questions and share ideas.	*I explain my ideas to other students.*
	Task Orientation	…it is important to complete activities planned and to stay on the subject matter.	*I pay attention during this class.*
	Personal Relevance	…subject is relevant to students' everyday out-of-school experiences.	*I relate what I learn in this class to my life outside of school.*
	Cooperation	…students cooperate with one another on learning tasks.	*When I work in groups in this class, there is teamwork.*
	Differentiation	…teachers cater for students differently on the basis of ability, rates of learning and interests.	*I am able to work at the speed which suits my ability.*

	ACTUAL					PREFERRED				
Equity	Almost Never	Seldom	Some times	Often	Almost Always	Almost Never	Seldom	Some times	Often	Almost Always
14. I get the same amount of help from the teacher as do other students.	1	2	3	4	5	1	2	3	4	5

Figure 3.4 Side-by-side response format for actual and preferred responses used in the COLES

3.4.2.2 Students' Attitudes and Self-Efficacy Beliefs

The second instrument, administered to students in phases 1 and 3, was the Attitudes and Self-Belief Survey (ASBS). The ASBS was based on an instrument developed

by Aldridge and Fraser (2008) to assess students' attitudes in an outcomes-based learning environment. The premise underlying the use of this instrument was that the data would provide teachers with a greater understanding of their students' attitudes towards learning in their particular subject. It was felt that this, along with data gathered from the COLES would further inform teachers' efforts to improve the classroom learning environment.

The final version of the ASBS was comprised of two scales, Attitude to Subject and Academic Efficacy, each with seven items (14 items in total). A description and a sample of an item for each scale are provided below in Table 3.5.

Table 3.5 Description and sample item for each ASBS scale

Scale	Description	Sample Item
	The extent to which …	
Attitude to Subject	…students enjoy the subject being taught.	*These lessons increase my interest in this subject.*
Academic Efficacy	…students believe they can achieve competence in the subject being taught.	*I feel that I will achieve a good result in this subject.*

Students responded to each of the items using a five-point frequency scale consisting of Almost Always, Often, Sometimes, Seldom and Almost Never. Figure 3.5 provides an example item and the response format used for items in the ASBS. A more detailed description of the development of the ASBS and the theoretical basis for the inclusion of individual scales is provided in Chapter 4. A copy of the ASBS can be found in Appendix E.

		ACTUAL				
	Academic Efficacy	Almost Never	Seldom	Some times	Often	Almost Always
76.	I find it easy to get good grades in this subject.	1	2	3	4	5

Figure 3.5 Illustration of the response format for items in the ASBS

3.4.2.3 Teacher Evaluations

The research program involved gathering evaluative feedback from participating teachers which, along with data collected from the focus teachers (discussed in the next section), could be used to address Research Questions 1, 3 and 4. Each year, all of the teachers involved in the pre−post group were asked to complete a survey, as part of the final phase of the research (Phase 6). In the first instance, quantitative data collected from respondents was used to improve the reliability of the two instruments and to help address Research Question 1. In subsequent years (44 respondents in 2009 and 78 respondents in 2010), quantitative data collected from the teacher survey was used to help address Research Questions 3 and 4.

The Teacher Evaluation Survey (a copy of which is provided in Appendix F) was designed to give participating teachers the opportunity to comment on: 1) the COLES and the ASBS; 2) the feedback packages; and 3) associated activities undertaken as part of their involvement in the research program. It was envisaged that this data would provide an understanding about the ways in which teachers utilised student feedback and to provide the teachers' perspective on the research process in which they were engaged. Teachers were asked to respond to a total of 13 items which were grouped under five categories, a description of each category and an example item is shown below in Table 3.6.

The first three categories of the Teacher Evaluation survey (Learning Environment Questionnaire; Teacher Feedback Packages and Teacher Professional Development), required teachers to respond to each of the items using a Likert scale of Strongly Disagree, Disagree, Neither Agree or Disagree, Agree and Strongly Agree.

The first category was designed to gauge the usefulness of the two instruments (referred to as 'the learning environment questionnaire'). The second category, focused on gathering teachers' views about the feedback package containing the student feedback and how they were able to utilise the feedback as part of their action research activities. The third category, gathered data regarding the nature and type of activities undertaken and how these linked to teacher professional development.

Table 3.6 Description and sample item for each category of the Teacher Evaluation Survey

Category	Description	Sample Item
	The extent to which …	
The Learning Environment Questionnaire	…teachers felt that the instrument provided relevant information about their students and classroom environment.	*The questionnaire items included the sorts of things that would interest a classroom teacher.*
Teacher Feedback Packages	…teachers were able to use the data to identify and plan for improvement.	*Information in the pre-test feedback package helped me to identify possible issues, challenges or issues with a particular class (or classes)*
Teacher Professional Development	... the activities undertaken as part of the study linked to teacher professional development.	*Involvement in this study helped me to reflect on my current teaching practices.*
Data for Reflection	...teachers utilised the data individually or collaboratively.	*Did you...work collaboratively with another teacher or a group of teachers?*
Teacher Involvement	... teachers felt that their involvement in the study was influenced by factors other than the school.	*It was part of a school based professional development and was linked to our curriculum plan.*

The last two categories, Data for Reflection and Teacher Involvement, required teachers to indicate, from a list of items, any which they felt applied to them. For each of these categories, there was a space for further comment. The Data for Reflection category was used to identify the ways in which teachers used the student feedback. For example, whether teachers worked individually or collaboratively or accessed professional development within or outside of their immediate school context or put in place strategies that they were already aware of. The Teacher Involvement category was used to gain an understanding of the factors motivating teacher involvement in the research.

3.4.3 Qualitative Data Collection

Qualitative information was gathered during phases 2, 4 and 6 of the research program (see Figure 3.3). Multiple sources of information were gathered through: interviews (Section 3.4.3.1); annual forums (Section 3.4.3.2); written reports, summaries and reflective journals from focus teachers (Section 3.4.3.3); and a range of school-based documents (Section 3.4.3.4).

3.4.3.1 Interviews

Interview data were collected from three groups of participants: teachers (including the focus teachers and teachers from the critical instance school); students; and administrative staff at the critical instance school.

Students. To investigate whether students 1) interpreted the items of the surveys in ways that were intended by the researcher and 2) could use the response format meaningfully, semi-structured, in-depth interviews were conducted with 12 students drawn from the classes of focus teachers (sampling ensured a representative number of girls and boys with a range of reading abilities). These interviews (used to help to examine the validity of the surveys) were conducted in the first year of the study. (See Appendix G for examples of the questions used during these interviews).

Teachers. Three groups of teachers were interviewed, for different purposes, during the research process. First, to investigate the ways in which teachers utilised the student perception data using the two instruments (Phases 2 and 4 of the research) and to address Research Questions 3 and 4, interviews were conducted with the focus teachers (12 teachers in 2008, 13 teachers in 2009 and 20 teachers in 2010) throughout the action research process. At least one focus teacher from each of the seven focus schools was interviewed each year, subject to the availability of the teacher. A total of 21 focus teachers were interviewed over the three-year period. These interviews focused largely on the student feedback generated for a particular class, and the types of activities undertaken as part of the action research. In-depth, unstructured interviews were used to provide flexibility to explore the processes used by the teachers as they described their experiences and recalled the strategies they had implemented (Kvale, 1996; Schensul, Schensul & LeCompte, 1999). These interviews were generally recorded using a digital recorder and field notes and were later transcribed for analysis. (See Appendix H for an example of the questions used for these interviews).

To provide information about the ways that teachers utilised student feedback, teachers were encouraged to discuss with me the actions that they would take at each stage of the action research process. In the majority of cases, the pre-test feedback

packages were delivered to teachers as part of a workshop, designed to assist them to make sense of the data. Although the means of delivery (e.g. whole group, small group or one-on-one) varied from school to school, all teachers were provided with an opportunity to discuss, with myself and other teachers, their approach and the types of strategies that they would trial. At the conclusion of the workshops or one-on-one sessions, these discussions were recorded as field notes and were used to address Research Question 3.

In addition, in-depth, semi-structured interviews with four of the focus teachers who were teaching at the critical instance school were used to examine views on the possible merits of using teacher action research for teacher professional development (to help to answer Research Questions 3 and 6) (See Appendix H for an example of the questions used for these interviews).

In addition to these in-depth interviews, discussions and conversations with teachers during the administration of the surveys were included as a source of information. These discussions provided information related to teachers' views of the survey, the survey process (which varied slightly from school to school), teachers' views of the feedback packages and the action research process. Notes, related to these discussions were recorded as field notes immediately after each observation and contributed to the data used to address Research Question 4.

To investigate school-level initiatives at the critical instance school (Phase 5 of the research process), semi-structured interviews were conducted with two members of the school's leadership team, the curriculum manager and the principal. These interviews were used to provide information about their school improvement strategies and to gain an understanding of how the leadership team envisaged the teacher action research contributed to these school improvement initiatives. Data collected from the leadership team at the critical instance school was used to address Research Question 5 which sought to investigate the ways that this school utilised student perception data for school and teacher improvement. (See Appendix I for an example of the questions used in interviews with members of the leadership team.)

3.4.3.2 Annual Forums

All focus teachers were invited to participate at a forum held at the end of each year. Participants at these forums were given opportunities to present their findings, discuss the types of strategies which were employed and engage in a range of activities designed to evaluate the processes undertaken as part of their action research and the research program. All discussions were recorded and summaries were collected from participants to further document and evaluate the processes undertaken as part of their action research. In the first year of the study, notes drawn from the activities of these teachers were used to further assess translation validity and guide refinements to the two instruments. In subsequent years, qualitative data gathered at the annual forums were used to specifically address Research Questions 3 and 4. (See Appendix J for an indication of the format and activities of the forums for 2008, 2009 and 2010).

3.4.3.3 Written Reports, Summaries and Reflective Journals

To help to answer Research Questions 3 and 4 (Phase 6 of the research), qualitative information were gathered using reflective journals, written reports and summaries that were written by the teachers in the focus group (Erickson, 1998; Gudmúndsdóttir, 2001; Patton, 2002). During the action research process, focus teachers were asked to document their activities using a reflective journal (Daniels, 2002). The journal was intended to be used by teachers to record the strategies that they used and their feelings with respect to the problems and success associated with implementing the strategies. A guide for reflection at each stage of their action research process and an initial planning sheet was provided to all teachers as part of their feedback package. Appendix A provides the guide for reflection and the initial planning sheet (a completed example) which was provided to each of the focus teachers. In addition to the reflective journals, each of the focus teachers submitted a written report and a summary using a template that was provided to them during the workshop, small group or one-on-one session. (See Appendix K for an example of the written report and summary templates.) The written report, completed by focus

teachers, outlined what they did, the types of strategies implemented and the effect these strategies had on their classroom and their teaching practices.

All of the teachers involved in the research were also invited to comment on the research process and their involvement. In addition to quantitative data, the Teacher Evaluation Survey (described in Section 3.4.2.3) also provided space for written comments that were collated accordingly.

3.4.3.4 School Documents

Phase 5 of the research sought to address Research Question 5, which investigated the way student feedback was used, as part of a teacher professional development activity, to support school improvement initiatives at the critical instance school. In addition to interviews, information was gathered from the annual reports written for 2008, 2009 and 2010, school policies and operational plans along with documents related to initiatives implemented by the school. These documents were used to provide information about the school-wide initiatives and the links made at the school level regarding the action research activities, teacher professional development and school improvement.

3.5 DATA ANALYSIS

This section describes how the data was analysed to address each of the research questions.

3.5.1 Instrument Validation

The first research question sought to investigate whether the COLES and the ASBS were reliable and valid instruments when used in secondary high school settings in Western Australia. To address this question, the framework for construct validity, developed by Trochim and Donnelly (2008), was used. Trochim and Donnelly's (2008) framework suggests that a 'construct' should fulfil the requirements of two broader types of validity, 'translation-related' which includes face and content validity (Section 3.5.1.1) and 'criterion-related' validity which includes convergent, discriminant, concurrent and predictive validity (Section 3.5.1.2). While all four

validity types, described by Trochim and Donnelly (2008), were used to assess the COLES, only the convergent and discriminant validity were used to assess the ASBS (as the instrument was designed to measure students' views of their own competency and attitudes).

3.5.1.1 Translation Validity (Face and Content Validity)

Translation validity involves examining how well the research construct, or scale, is translated within the instruments. This involves two types of validity. The first, face validity, examines the extent to which the instruments are a good translation of the construct. The most important check on face validity involves seeking the opinions of participants in the study (Munby, 1997) and examining whether or not participants responded to items in ways that were intended by the researcher. The second type, content validity, assesses the extent to which the content domain is both theoretically sound and representative of the construct itself.

In the first year of the study, to ensure that the two instruments fulfilled the criteria of translation validity, the two instruments were closely scrutinised. Qualitative information gathered from students (n=12) who responded to the two instruments, was gathered to ensure that they had understood the items and were able to use the response format effectively. In addition, data were gathered from teachers who made up an expert panel (comprised of two teachers and two curriculum leaders) who were asked to evaluate and review the instruments and teachers involved in the end of year forums who were involved in a range of activities, designed to evaluation the content of the surveys. These data were used to identify items considered to be problematic or of limited practical use to teachers.

3.5.1.2 Criterion-Related Validity

Criterion validity involves checking the performance of the instruments against the theory of the construct and generally involves four types of validity (Trochim & Donnelly, 2008), namely, convergent validity, discriminant validity, concurrent validity and predictive validity. Each of which is described below.

Convergent validity, examines the degree to which items in a specific scale are similar to other items of the same scale. When the goal is to construct a multiscale questionnaire, factor analysis provides a means of determining whether items within the same scale are tapping into the same construct and whether each scale is assessing a distinct construct. Principal axis factor analysis with oblique rotation and Kaiser normalisation was used to examine the factor structure of both instruments. Oblique rotation, rather than orthogonal rotation, was used because oblique methods allows for factors to correlate and thus produces a better estimate of the factors. In contrast, an orthogonal rotation, which produces only uncorrelated factors, could result in the loss of valuable information (Brown, 2006; Costello & Osborne, 2005; Field, 2005). In addition, oblique methods are used when the factors are likely to overlap, as would be the case when investigating factors within classroom learning environments. Following the recommendations of Field (2005), Stevens (1992) and Thompson (2004), the two criteria used for retaining any item were that it must have a factor loading of at least 0.40 on its *a priori* scale and less than 0.40 on any of the other scales. In addition to the principal factor analysis, scale reliability estimates, using the Cronbach alpha reliability coefficient (as an index of scale internal consistency), were also used to assess the convergent validity of the COLES and the ASBS.

Discriminant validity, examines the extent to which scales in each instrument diverge from those scales which they should not be similar to. To assess the discriminant validity of the COLES and the ASBS, in the first instance, the principal factor analysis (described above) was used to check whether any of the scales in the COLES or ASBS loaded on any another scale. The component correlation matrix, generated from the principal factor analysis was used as evidence to establish that each scale for the COLES measured a dimension distinct from other scales. The internal consistency of each scale in the ASBS was assessed using Cronbach's alpha coefficient for two units of analysis (the individual student and the class mean).

Concurrent validity examines the instrument's ability to distinguish between the groups which it is expected to distinguish between. In this case, it was expected that students within the same class would perceive the classroom environment in a

similar way, while the class mean would vary from classroom to classroom. To examine the concurrent validity of the COLES, a one-way analysis of variance (ANOVA), with class membership as the independent variable, was computed to determine the degree to whether each scale was able to differentiate between the perceptions of students in different classes. The common indices used from ANOVA, and reported in this thesis, are the significance level and the eta^2 statistic, which is the ratio of 'between' to 'total' sums of squares and indicates the proportion of variance explained by class membership.

Finally, predictive validity assesses the instruments' ability to predict something it should theoretically be able to predict. Past research has shown that the learning environment is a strong predictor of student affective outcomes (Aldridge & Fraser, 2008; Fraser, 2007, 2012; Walker, 2006). To assess predictive validity of the COLES and to identify any associations between students' attitudes and academic self-efficacy beliefs with the classroom learning environment, correlations between the scales of the COLES and the ASBS for the pre-test were examined using a two-tailed Pearson coefficient.

3.5.2 Examining Pre−Post Differences

The second research question sought to investigate whether teachers were able to make use of student feedback to develop and implement strategies that improve students' perceptions of the learning environment. The pre–post sample, described in Section 3.3.2, was used to examine the extent to which teachers were able to utilise the data, derived from the two instruments to implement changes in their classrooms. Descriptive analysis, based on students' responses to the COLES and the ASBS included the average item mean (the scale mean divided by the number of items in that scale) and the average item standard deviation for each scale for both the pre-test and the post-test. This data was used to identify whether there were pre–post improvements in students' perceptions of the learning environment, their attitudes and academic self-efficacy beliefs. Multivariate analysis of variance (MANOVA) with the testing occasion (pre-test or post-test) as the independent variable and the instrument' scales as the dependent variables, was used to determine whether student

scores on the COLES and the ASBS differ between the two administration periods. Effect sizes were also calculated (as recommended by Thompson, 1998, 2001) to estimate the magnitude of the difference between the actual responses in the pre-test and the post-test.

Further analysis was undertaken to ascertain whether there were any differences between the teachers who used the feedback data for reflection purposes only (414 teachers and 508 classes) and those teachers who formally implemented an action research project (45 teachers and 52 classes). As there were no statistically significant differences in the pre-test between the focus group and the 'reflection-only' group, it was considered acceptable to examine difference for the post-test data only. The average item mean, or the scale mean divided by the number of items in that scale and the average item standard deviation was calculated for each scale using actual version of student responses for the post-test for both the focus group and the 'reflection-only' group. MANOVA, with the class mean as the unit of analysis, was conducted with the scales for the COLES and the ASBS as the dependent variables and the group type (focus or reflection only) as the independent variables. Effect sizes were calculated to estimate the magnitude of the difference between any improvements which may have occurred for each of the two groups.

To investigate the extent of school-level change for the critical instance case study school, the pre–post sample for this school was used to examine the efforts of whole-school improvement initiatives. In terms of changes over the three years (between 2008 and 2010), one-way MANOVAs were conducted separately with each set of scales for the COLES and the ASBS as the dependent variables and the year as the independent variable. Tukey's HSD post hoc procedure was then used to identify for which pairs of years, the between-year difference on each scale was statistically significant. Effect sizes were also calculated (as recommended by Thompson, 1998, 2001) to estimate the magnitude of the difference between each pairs of years.

3.5.3 Using Student Perception Data to Guide Teacher Action Research

To answer Research Questions 3, 4 and 5, 'grounded theory' methods of qualitative data analysis, as described by Strauss and Corbin (1990, 1994), were used to

generate theory about the ways that teachers used student perception data to improve their classroom learning environments. The grounded theory approach is largely inductive, where theories are derived from and based on, the data collected, rather than the data being collected to test a hypothesis (Taylor & Bogden, 1998). Although it may be argued that a pure inductive approach is difficult to achieve, as it is not easy to ignore a researcher's pre-existing assumptions about the world, such an approach is possible as long as the focus is on generating theory (in the form of propositions) based on the data collected and not the reverse (O'Donoghue, 2007; Taylor & Bogden, 1998).

As a first step, qualitative data, gathered during phases 2, 4 and 6 from the 45 focus teachers, were analysed using qualitative techniques associated with the grounded theory approach (Strauss & Corbin, 1990, 1994) to identify common themes, similarities and differences between the experiences and opinions of the participating teachers as they carried out their action research. Other qualitative data collected during phases 5 and 6, including school planning and policy documents, reports, transcripts and notes of interviews with school administrators were also analysed using the same methods.

An 'editing analysis style', first observed by Crabtree and Miller (1992) and described by Polit, Beck and Hungler (2001) was used to sort and organise the data. This involved reading through each piece of data to identify meaningful segments and, after some review, the parts were then categorised and coded. The categorised data was then sorted and organised accordingly. This process made it possible to identify patterns and connections between the categories and the generation of propositions.

The analysis of the qualitative data involved the application of open coding through the use of the constant comparison method (Glaser, 1992; Strauss & Corbin, 1990. 1994). Concurrently, concepts and categories were generated into propositions through analytic induction (O'Donoghue, 2007). These procedures were applied with flexibility over the three-year period to suit the changing circumstance of the

research program in relation to data collection, analysis and the formulation of theory.

Open coding was generally applied first and was used to identify categories and sub-categories in the data collected. The data was broken down into concepts which could be closely examined and compared for similarities and differences and constant questioning such as 'what is happening here?' and 'how is this similar or different to...?' was asked of the data (Glasser, 1992). Over the three-year period, the notes and transcripts from semi-structured interviews with teachers and school administrators were coded on a line-by-line basis with code words written in the margins (Schatzman & Strauss, 1973). Open coding was also used on each of the written reports, summaries and reflective journals of teachers in the focus group as well as my own field notes of classroom observations, emails, telephone conversations and written recordings of discussions and activities during the teacher forums held at the end of each year. Other documents, provided by teachers and school administrators, were also subject to open coding. During the open coding, the process of constant comparison was employed, driven by analytic procedures focused on emerging categories of data (Strauss and Corbin, 1990, 1994) and making comparisons between data, concepts and categories already identified (Glasser, 1992).

Over the three-year period, open coding was used to sort and organise the qualitative data collected. The method of constant comparison enabled the research questions to be drafted, reviewed and refined on the basis of the key ideas and generalisations emerging from the data collected. It also focused the collection of additional data to better explain and enable a greater understanding of the processes and experiences from the view of the participants involved in the research. The initial phases of data analysis led to the identification of the critical instance school which, in turn, led to the collection and analysis of qualitative data used to address Research Question 5 (which investigated the ways in which the school utilised student perception data for teacher professional development and to support school initiatives for whole school improvement).

During the data analysis phase, third person narratives (written from the researcher's perspective) interwoven with direct quotes were developed using the written reports, summaries, notes from the reflective journals and interviews with focus teachers. It was envisaged that these narratives would provide rich descriptions which would illustrate the generalisations and understandings emerging from Part B of the research program. These generalisations and understandings, in turn, were used to help make sense of the inferences generated from the quantitative data collected in Part A of the research program.

3.6 ETHICAL CONSIDERATIONS

There were a number of ethical issues and concerns which required consideration before commencing the research and during the research program. These issues ranged from ensuring that appropriate permissions were obtained from the relevant authorities and governing bodies to putting in place mechanisms to safeguard the possible negative impact of data collection on students and the use of such data with teachers. The ethical considerations are described below in terms of: information and permissions (Section 3.6.1); privacy and confidentiality issues (Section 3.6.2); possible risks and benefits (Section 3.6.3); and other considerations (Section 3.6.4).

3.6.1 Information and Permissions

A majority of the data collected for this research involved government secondary schools in Western Australia. In all cases, appropriate permissions were sought from individuals, schools and the organisation itself, as outlined by policy (DET, 2007). Prior to contacting schools, permission to approach school principals was sought from the Department of Education (Western Australia). To obtain the necessary approval, an outline of the research, including its ethics approval, proposed dates for its start and completion, its aims and benefits, methodology and details on how the results of the research would be disseminated, was provided. Sample forms including letters, consent forms and survey instruments as well a list of prospective schools were submitted for approval. As the primary researcher involved in the collection of the data, I obtained a 'Working with Children Check Assessment Notice' as outlined by the *Working with Children (Criminal Recording Checking) Regulations 2005*.

Information was provided to students and parents, through the school, prior to each administration period. Student consent was also obtained prior to completion of the first administration period and students were not required to participate if they chose not to. All students, teachers and schools were provided with verbal and written information related to the research program which included a general overview of the research, what was involved and a series of frequently asked questions. Teacher participation in the research was voluntary and it was made clear that they could withdraw at any time. Teachers included in the focus group also signed a consent form.

3.6.2 Privacy and Confidentiality Issues

Students completing the surveys were made aware that they had the right to refuse to be involved, that all information gathered would remain anonymous and that their individual responses would not be made available to their teachers. Codes, rather than names, were assigned to students and used on the surveys. Once all of the data was collected and analysed, these codes were separated from the core data to ensure that anonymity was maintained.

Teacher profiles, generated for each class, were shared only with the teacher of that class. The profiles were used for the purpose of providing teachers with feedback that they could use to identify areas on which they could formulate and implement strategies for change. To ensure that both teachers and students could not be readily identified, teachers were assigned a random number, known only to my supervisor and myself and, once the data was analysed, these numbers were separated from student data prior to archiving. All quantitative data was maintained using a system of individual codes to enable myself or my supervisor to re-identify an individual's data and destroy it if participation was withdrawn.

To satisfy the 'audit trail' (described by Lincoln and Guba, 1985), a key component to help demonstrate the credibility and dependability of qualitative studies, all qualitative data was stored in both hard copy and electronic format. Interview recordings were transcribed, coded and filed. Field notes and other documents were also coded and filed. Lists of categories and sub-categories were stored separately

from the data. As with the quantitative data, qualitative data was maintained in such a way to enable myself or my supervisor to re-identify data specific to an individual and destroy it if participation was withdrawn. Codes and memos were also referenced and filed, so that they could be easily retrieved and cross-referenced if required. Pseudonyms were used in written narratives to protect individual identities and care was taken to ensure that schools were not easily identified.

3.6.3 Possible Risks and Benefits

A profile generated from student responses may highlight areas for improvement related to teacher behaviours and practices. It was recognised that, in some cases, teachers may feel affronted by the feedback provided to them. To combat this, a degree of sensitivity, including additional time and support was implemented as required for those teachers. Participating teachers were always given the option of receiving their feedback information on an individual or small group basis. This alleviated issues related to teacher concerns about what the data would show. This also provided significant benefit to me, as it enabled me to work more closely with participants and to gain insights into the ways teachers approached their data and the activities being undertaken as teachers engaged in the action research process.

3.6.4 Other Considerations

It was envisaged that the number of times and amount of time required for students to complete a survey, as well as their general willingness to participate, could limit the reliability of the data collected. To overcome this, I liaised closely with teachers and schools to ensure that adequate time was allowed for students to respond to the instruments and, when a large number of classes were surveyed in one school, ensured that the administration of the instruments were timetabled over a period of time rather than to occur in one day. To encourage student participation, teachers were asked to discuss the survey and its purpose with students prior to the start of the administration period.

Time was also a key consideration. When organising times for teacher interviews, the end of year forum and for the collection of written reports, summaries and

journals, I liaised with individual teachers and schools to ensure that adequate notice was given for interviews and meetings. To overcome some of time constraints, teachers in the focus group were given the option of submitting their reports electronically and doing telephone, rather than face to face interviews. Respondents to the Teacher Evaluation Survey were given the option of completing the survey online, submitting it electronically or by post or were given the opportunity to contact me directly and give their feedback in person or over the telephone.

3.7 CHAPTER SUMMARY

This chapter described the research methods used in a research program that was conducted over a three-year period and involved a total of 10,345 student responses (2042 student responses in 2008, 4467 student responses in 2009 and 3836 student responses in 2010) in 684 classes (147 classes in 2008, 298 classes in 2009 and 239 classes in 2010) in 29 co-educational high schools from regional and metropolitan Western Australia. This involved a total of 549 teachers (107 teachers in 2008, 248 teachers in 2009 and 194 teachers in 2010).

The study adopted a multi-method approach comprised of two concurrent and interrelated investigations within one research program. The first investigation (Part A) focused on the development and validation of two instruments: one to assess students' perceptions of their learning environment and the other to assess students' attitudes and academic self-beliefs. This investigation was deductive with a positivist world view and utilised quantitative methods of data collection and analysis. The second part of the research program (Part B) investigated the ways teachers utilised student perception data (collected for Part A of the research program) as part of an action research process to reflect and implement strategies for improvement. This investigation was inductive with an interpretivist world view which utilised qualitative methods of data collection and grounded theory (Strauss & Corbin, 1990, 1994) for data analysis which involved coding, constant comparative and the generation of propositions (Glaser, 1992; O'Donoghue, 2007; Strauss & Corbin, 1990, 1994).

The research utilised different 'grain sizes' (Fraser, 1999) for data collection and analysis over the period of the research. The largest 'grain size' involved the whole sample (described above) and was used to address the first research question. At the next grain size, a pre–post sample comprised of 459 teachers (91 teachers in 2008, 210 teachers in 2009 and 158 teachers in 2010) and 560 classes (122 classes in 2008, 248 classes in 2009 and 190 classes in 2010) was used to address the second research question which examined whether or not teachers were able to make use of student perception data to improve their respective classroom learning environments. At the next grain size, the teacher evaluation group made up of 129 teachers (seven teachers in 2008, 44 teachers in 2009 and 78 teachers in 2010) was used to ensure that the two instruments achieved good translation validity. To specifically address Research Question 4, a smaller sample comprised of 45 focus teachers (12 teachers in 2008, 13 teachers in 2009 and 20 teachers in 2010) was monitored more closely than others during the action research process. Data collected from this group was used to investigate the ways that teachers utilised student perception data for improvement. At the smallest grain size, data derived from a critical instance case study was used to address the last research question which sought to investigate the ways schools could utilise student perception data to support school improvement initiatives. This sample was comprised of 729 student responses (192 student responses in 2008, 290 student responses in 2009 and 247 student responses in 2010) gathered from 64 classes (18 classes in 2008, 25 classes in 2009 and 21 classes in 2010).

To establish the validity and reliability of the two instruments (Part A of the research program), the Constructivist-Oriented Learning Environment Survey (COLES) and the Attitudes and Self-Belief Survey (ASBS), Trochim and Donnelly's (2008) framework for construct validity was used. In the first instance, this involved ensuring translation validity (comprised of face and content validity). In the second instance, the instruments were assessed for criterion validity (comprised of convergent, discriminant, concurrent and predictive validity). To do this, statistical analyses involving data from the whole sample including: factor and item analyses; reliability and discriminant validity analyses were undertaken for each year of the research. In addition, ANOVA were used to examine whether the scales used in the

COLES could differentiate between the perceptions of students in different classrooms were undertaken for each year of the research.

To investigate whether teachers were able to make use of the student feedback to improve students' perceptions of the learning environment, multivariate analysis of variance (MANOVA) was used to examine the extent of pre–post changes for the whole sample, in addition, effect sizes were calculated to gauge the magnitude of change between the pre-test and post-test.

Further, this study examined whether pre-post differences existed for teachers who used the data as part of a more formal action research process (focus teachers) and those who used the data for reflection purposes only (reflection-only). As there were no statistically significant differences between the pre-test scores for focus teachers and the reflection-only teachers, MANOVA was used to examine the differences for the post-test scores only. Effect sizes were also calculated to gauge the magnitude of these differences.

Finally, one way MANOVAs were used to examine pre–post changes at the school-level for the critical instance case study. Tukey's HSD post hoc procedure was then used to identify for which pairs of years, any statistically significant between-year difference for each scale. In addition, effect sizes were calculated to estimate the magnitude of any differences.

Part B of the research program investigated the ways that teachers used student feedback generated from the two instruments (developed in Part A of the research program), to guide their improvements to the classroom learning environment. To do this, qualitative data were gathered using written reports, school documents, policy documents; reflective journals, summaries, interview transcripts and field notes. These data were analysed using techniques associated with the grounded theory approach (Strauss & Corbin, 1990, 1994). This involved the application of open coding, the use of the constant comparison and the development of propositions (theory) through analytic induction.

To assist with the articulation of the data analysis, third person narratives were developed from qualitative data collected from teachers in the focus group, these teachers were engaged in a more formalised and structured action research process and were monitored more closely than other teacher participants. It was envisaged that these narratives would provide significant insights into the ways teachers used students' perception measures as part of their improvement efforts.

There were a number of ethical considerations for the research program. The first of these related to ensuring confidentiality and anonymity of participants. Appropriate permissions and consents were sought from participants and in the case of government schools, the Department of Education (WA). Other ethical considerations related to the administration of the two instruments, ways to ensure good reliability of results and limit issues related to survey fatigue. It was also important consider ways to limit the potentially negative impact student perception data could have on individual teachers and overcome the constraints of data collection in busy school environments when accessing teachers and classes is often challenging.

The development and validation of the COLES and the ASBS are discussed in the next chapter.

CHAPTER 4

DATA ANALYSIS AND RESULTS

Instrument Development and Validation

4.1 INTRODUCTION

A key component of the research presented in this thesis focused on the development of two instruments: one to assess students' perceptions of the learning environment and another to assess their attitudes and academic self-efficacy beliefs. It was important that these instruments could: firstly, provide classroom teachers with information about the learning environment, students' attitudes and academic self-efficacy beliefs that they considered to be useful; secondly, be used by teachers to reflect on their teaching practices; and thirdly, be helpful in guiding teachers to select strategies aimed at improving the learning environment.

As discussed in the previous chapter, the two instruments developed for this study were the Constructivist-Oriented Learning Environment Survey (COLES) and the Attitudes and Self-Belief Survey (ASBS). Data collected over three years from the 10,345 students in 684 secondary high school classes (the details of which were provided in chapter 3) were used to address the first two research questions:

1. Are the two instruments developed to assess students' perceptions of the learning environment, students' attitudes and academic self-efficacy beliefs reliable and valid for use in secondary high schools in Western Australia?
2. Are teachers able to make use of student feedback (based on responses to the two instruments) to develop and implement strategies that improve students' perceptions of the classroom learning environment?

This chapter reports the findings pertaining to the first research question, for which the data were analysed to support the validity and reliability of the two instruments and is reported under the following headings:

- Development of the COLES (Section 4.2);
- Development of the ASBS (Section 4.3);
- Validation of instruments (Section 4.4); and
- Chapter Summary (Section 4.5).

4.2 DEVELOPMENT OF THE COLES

The development of the COLES was driven by a strong desire to provide the types of information that would best inform teachers when working to transform their classrooms to ones in which the focus was on student learning. It was important, therefore, to ensure that the items included in the survey were reflective of aspects of the learning environment that teachers wanted to be included. In addition, it was important that teachers felt confident that the survey would provide feedback that was valid and reliable.

To ensure that the survey was useful in terms of assessing classrooms with a constructivist orientation, I started by identifying principles that were relevant to more student-centred classrooms and which are consistent with pedagogy considered to be more constructivist in nature (Curriculum Council, 1998). These principles were used to identify dimensions that formed the basis for selecting specific scales.

As described in Chapter 3, the Constructivist-Oriented Learning Environment Survey (COLES) was based largely on scales drawn from a range of existing instruments. Six of the 11 scales of the COLES were adapted from the widely-used What Is Happening In this Class? (WIHIC, Fraser et al., 1996) questionnaire. One scale, the Young Adult Ethos scale, was adapted from the Technology-Rich Outcomes-Focused Learning Environment Instrument (TROFLEI, Aldridge & Fraser, 2008), a second scale, the Differentiation scale, was modified from the Individualised Classroom Environment Questionnaire (ICEQ, Rentoul & Fraser, 1979) and the Personal Relevance scale was based on a scale from the widely-used Constructivist

Learning Environment Survey (CLES, Taylor et al., 1997). Two further scales, Formative Assessment and Clarity of Assessment Criteria, were developed for the purpose of this research. Table 4.1 shows the relevance between each scale for the COLES and the Principles of Learning, Teaching and Assessment described the Curriculum Framework (Curriculum Council, 1998) (which was the key curriculum document in Western Australia during the period of research) as well as the origins of each scale.

Using Trochim and Donnelly's (2008) framework for validity, an important first step, was to examine the extent to which each of the scales had a sound theoretical foundation. This information could then be used to examine whether the items within each scale effectively assessed the construct it was designed to assess. The following sections provide a description of each of the scales and a theoretical basis for the selection of each. Each of the 11 scales of the COLES have been grouped according to the category into which it falls, these being: Relationships (described in Section 4.2.1); Assessment (described in Section 4.2.2); and Delivery (described in Section 4.2.3).

4.2.1 The Relationship Dimension

The Relationship dimension focuses on the group dynamics within the classroom and is comprised of four scales (Student Cohesiveness, Teacher Support, Equity and Young Adult Ethos) which assess students' perceptions of student-student and teacher-student interactions and their place or status within the classroom. This section describes each of the four scales and its importance in terms of teaching and learning in more student-centred classrooms.

4.2.1.1 Student Cohesiveness

Two scales were selected for assessing the extent to which students feel that their learning environment and the relationships which exist within that environment are conducive to learning, namely, Student Cohesiveness and Teacher Support. The first of these scales, Student Cohesiveness, originally developed for the WIHIC (Fraser et al., 1996), was selected and modified for use in the COLES, to assess the extent to

which students know, help and are supportive of one another. To make sure that the environment is supportive of student learning, it is beneficial for teachers to employ practices that help students to feel that they are accepted and supported by their peers (Curriculum Council, 1998). In a supportive environment, students are able to make mistakes without the risk of being ridiculed. Strong relationships have been found in past research to have a strong influence on students' outcomes (Cotterell, 1992; Nichols & White, 2001; Stewart, 2008).

4.2.1.2 Teacher Support

The second scale, Teacher Support, assesses the extent to which students perceive that the teacher helps, relates to, trusts and is interested in them (Moos & Trickett, 1987). This scale, also originally developed for the WIHIC (Fraser et al., 1996), was selected and modified for use in the COLES because the teacher's relationship with his or her students is a pivotal aspect of any learning environment, which can lead the student to love or hate a subject; to be inspired or turned away from learning. Teacher support can come in many forms; from helping students with learning tasks, to showing care and interest in the student's well-being. Research has shown that the supportiveness of a teacher may give students the confidence they need to tackle new problems, take risks in their learning and to work on and complete challenging tasks (Loukas & Robinson, 2004; Wentzel, 1994; 1997). Students who perceive their teachers to be supportive are more likely to be engaged (Hughes, Zhang & Hill, 2006; Patrick, Ryan & Kaplan, 2007) and to seek help when they encounter difficulties (Marchand & Skinner, 2007).

The teacher's relationship with his or her students, in many ways, is integral to creating a safe, cooperative learning environment (Hijzen, Boekaerts & Vedder, 2007). Research has reported that teacher responsiveness to students' needs contribute positively to student motivation, academic outcomes and self-efficacy (Marchand, Paulson & Rothlisberg, 2001). Positive associations have also been reported between perceived support from teachers and higher self-esteem, improved social skills and improved academic performance in students (Demaray & Malecki, 2002; Malecki & Elliott, 1999; Marchand & Skinner, 2007).

Table 4.1 Development of the scales in the COLES and relevance to the Curriculum Council's (1998) Principles of Learning, Teaching and Assessment

	Scale	Description	Relevance to the Teaching, Learning and Assessment Principles in the Curriculum Framework (Curriculum Council, 1998)	Scale Adapted From:
RELATIONSHIPS		The extent to which …		
	Student Cohesiveness	…students know, help and are supportive of one another.	*Supportive Environment:* The learning environment should provide a cooperative atmosphere in which students feel that they are supported by their peers.	What Is Happening In this Class? (WIHIC)
	Teacher Support	…the teacher helps, befriends, trusts and is interested in students.	*Supportive Environment:* The learning environment should provide a cooperative atmosphere in which students feel that they are supported by their peers.	What Is Happening In this Class? (WIHIC)
	Equity	…students are treated equally by the teacher.	*Supportive Environment:* Education is for all students – the learning environment should provide an atmosphere in which all students feel that they are treated in a way that is fair.	What Is Happening In this Class? (WIHIC)
	Young Adult Ethos	…teachers give students responsibility and treat them as young adults.	*Independence and Collaboration:* Classroom practices should encourage students to take responsibility for their own learning.	Technology-Rich Outcomes-Focused Learning Environment Instrument (TROFLEI)
ASSESSMENT	Formative Assessment	…students feel that the assessment tasks given to them make a positive contribution to their learning.	*Educative:* Assessment should make a positive contribution to learning.	Developed for the COLES
	Clarity of Assessment Criteria	… the assessment criteria are explicit so that the basis for judgments is clear and public	*Explicit:* Assessment criteria should be explicit so that the basis for judgements is clear and public.	
DELIVERY	Involvement	…students have attentive interest, participate in discussions, ask questions and share ideas.	*Action and Reflection:* Learning experiences should encourage students to be active participants in the learning process.	What Is Happening In this Class? (WIHIC)
	Task Orientation	…it is important to complete activities planned and to stay on the subject matter.	*Motivation and Purpose:* Purposeful learning can be enhanced by making clear the long-term outcomes expected to result from students' engagement with the learning experiences provided.	What Is Happening In this Class? (WIHIC)
	Personal Relevance	…subject is relevant to students' everyday out-of-school experiences.	*Connection and Challenge:* Learning experiences should connect with students' existing knowledge, skills and values while extending and challenging their current ways of thinking and acting.	Constructivist Learning Environment Survey (CLES)
	Cooperation	…students cooperate with one another on learning tasks.	*Independence and Collaboration:* Learning experiences should provide students with opportunities to work collaboratively with others and contribute in various ways.	What Is Happening In this Class? (WIHIC)
	Differentiation	…teachers cater for students differently on the basis of ability, rates of learning and interests.	*Inclusivity and Difference:* Learning experiences should accommodate differences between students by providing time and conditions that acknowledge that students bring with them a range of experiences and develop at different rates.	Individualised Classroom Environment Questionnaire (ICEQ)

4.2.1.3 Equity

Given that it was considered important that the learning environment created by the teacher provides opportunities for all of the students in the class (Rennie, 2004; 2005), the Equity scale, originally developed for the WIHIC (Fraser et al., 1996), was selected and modified for use in the COLES to assess the extent to which students' perceive that the teacher treats them in a way that encourages and includes them as much as their peers. While it is acknowledged that equity is often associated with fairness, it is not necessarily about treating each student in the classroom the same way. According to Secada (1989), equity is closely aligned to issues of justice and sometimes, students need to be treated differently. This scale gives teachers an indication of whether students perceive that they are being treated fairly by the teacher.

4.2.1.4 Young Adult Ethos

For the purpose of this study, it was considered important that a high school environment encourages students to be responsible for their own learning (Aldridge & Fraser, 2008). Research has highlighted the importance of educators creating learning environments that foster a range of attributes to enable students to become effective, independent, self-directed and lifelong learners (Bandura, 1993; Boekaerts, 1997; Corno, 1992; Pintrich, 1995; Zimmerman, 1990) who exercise control over their learning and accept responsibility for their own learning and performance (Corno, 1992; Pintrich, 1995; Purdie & Hattie, 1996; Zimmerman, 1990, 1998). To examine the extent to which this occurs within the class, the Young Adult Ethos scale, originally developed for the TROFLEI (Aldridge & Fraser, 2008), was modified to assess whether students feel that teachers give them responsibility and treat them as young adults.

4.2.2 The Assessment Dimension

As discussed previously, it was considered desirable to link the scales to the principles of learning, teaching and assessment delineated by the Curriculum Council of Western Australia (Curriculum Council, 1998). While recent research has shown

that students' perceptions of the classroom environment to be significant positive predictors of student outcomes (Dorman, Fisher & Waldrip, 2006; Fraser, 2012), prior research in the field of learning environments had not considered the assessment used by teachers as a feature of the learning environment.

Assessment, particularly formative assessment, is critical for knowing how a student is performing academically and how best to support that student in the classroom (Allen, Ort & Schmidt, 2009). Making clear the goals to which students are striving and providing useful feedback on their progress provides a powerful means of improving student learning. In doing so, students are encouraged to reflect on their current understandings, and to plan for success in their future learning (O'Donovan, Price & Rust, 2004). The key curriculum document, used to guide teachers and schools during the period of this research (Curriculum Council, 1998), focused on assessment, part of which aimed to encourage a more formative approach. Therefore, it was meaningful that this study sought to encourage educators to consider ways they could use assessment in the teaching and learning process (Shepard, 2000). To do this, two scales were developed, described below, to gauge students' perceptions of the assessment practices used by the teacher, namely, Formative Assessment and Clarity of Assessment Criteria.

4.2.2.1 Formative Assessment

Formative assessment relates to assessment practices that form part of the learning process rather than a separate (summative) process conducted at the end of the learning journey (Bell & Cowie, 2001). The focus of the teacher, when using formative assessment, is to use information about students' learning and current understanding to make decisions to improve future learning (Atkin, Black & Coffey, 2001; Bell & Cowie, 2001; Black, 1993; Black, Harrison, Lee, Marshall & Wiliam, 2003; Black & Wiliam, 1998, 2004; Harlen, Gipps, Broadfoot & Nuttall, 1992; Harlen & James, 1996; Shepard, 2000; Tunstall & Gipps, 1996).

Formative assessment practices can provide opportunities for students to discuss their progress with their teachers as well as to engage in peer-assessment and self-assessment as ways of monitoring and reflecting on their learning. More importantly,

if students are able to recognise the link between their learning and assessment, then assessment becomes educative, improves student learning, enables students to plan for future learning and may foster self-directed learning practices (Bell & Cowie, 2001; Black & Wiliam, 1998). The Formative Assessment scale assesses the extent to which students feel that the assessment tasks make a positive contribution to their learning. Further to this, using assessment in a formative way to move students from what they already know to what they can do next. Wood, Bruner and Ross (1976) devised the term "scaffolding" to describe the types of support that teachers provide to students in their zone of proximal development to move them along, in terms of their learning (Shavelson, 2006; Torrance & Pryor, 1998). The items in this scale were designed to gather information about students' perceptions about the ways assessment was used formatively in the classroom.

4.2.2.2 Clarity of Assessment Criteria

The Clarity of Assessment Criteria scale assesses the extent to which the assessment criteria are explicit so that the basis for judgements is clear and public (Curriculum Council, 1998). While clear and public criteria can support and enhance a teacher's ability to make professional judgements about student learning, as a matter of fairness, students should also know the criteria by which they are being assessed. Early research on formative assessment identified the very act of sharing success criteria with students as one of five strategies, considered effective in improving student achievement outcomes (Black et al., 2003; Wiliam, 2000, 2006).

When a teacher uses success criteria to develop assessment and when conveying expectations, students and teachers, can then use assessment in a way that it provides a 'check on learning' and a means of gauging progress. When approaching assessment in this way, assessment criteria should be communicated clearly to students to help to guide them in their learning and goal setting (Heritage, 2007). These criteria provide a framework for the teacher, within which they are able to judge the level of understanding being demonstrated (Clarke, 2005). By doing this, a teacher's decisions about the types of instructional strategies which could be employed are guided by any gaps, observable by the teacher or identified by the

student themselves, between the learning goals and the success criteria (Wiliam, 2007).

4.2.3 The Delivery Dimension

The Delivery dimension of the COLES focuses on the ways that learning is organised in the classroom by the teacher and is comprised of four scales (Task Orientation, Differentiation, Personal Relevance, Involvement, and Cooperation). This dimension assesses students' perceptions of the ways teaching and learning activities are implemented in the classroom.

4.2.3.1 Differentiation

It was considered highly desirable for teachers to provide learning experiences that cater for student diversity. Differentiation involves the careful consideration of learning goals and content, the identification of student needs through on-going assessment that results in the modification of instructional strategies and activities to best support student learning (Tomlinson, 1999, 2003). Teachers who differentiate well, increase the likelihood that students will engage with content, develop in-depth understandings as well as the capacity to transfer these understandings into other learning contexts (Brimijoin, 2005; Tomlinson, Brimijoin & Narvaez, 2008). The Differentiation scale, originally developed for the ICEQ (Fraser, 1990), was modified for use in the COLES. This scale was included to assess the extent to which students perceive that teachers cater for students differently based on their need, capabilities and interests. This scale acknowledges that, within any classroom, students differ in terms of their abilities, rates of learning and interests and that while particular strategies may work for some students, they may not work for all (Berliner & Biddle, 1995, Brimijoin, 2005; Tomlinson, 1999, 2003).

4.2.3.2 Task Orientation

To assess the extent to which students perceive that it is important to complete activities and to understand the goals of the subject, the Task Orientation scale, originally developed for the WIHIC (Fraser et al., 1996), was selected and modified

for use in the COLES. Students need to have goals, both short-term and long-term, to provide them with motivation and purpose (Killen, 2001; Spady, 1994; Wiggins & McTighe, 2005). If goals are clear and relevant, students are more likely to be engaged in their learning. Coupled with the need to have meaningful goals is the need to have clear expectations and frequent feedback and reinforcement to ensure that students' time-on-task is optimised. According to research, students are more likely to be 'challenge seekers' than 'challenge avoiders', when process rather than achievement or performance is the motivator (Meyer, Turner & Spencer, 1997; Patrick, Anderman & Ryan, 2002). Task orientation and goal setting becomes more important when students appraise themselves and their own progress (Sadler, 1989), as they are likely to develop a sense of purpose and self-worth (Brookhart, Andolina, Zuza & Furman, 2004). Importantly, the act of goal setting, in conjunction with clarifying criteria for assessment and any feedback on assessment, should also be goal-directed, so that learners are provided with information to assist them to clarify future goals and to assess their progress towards specific learning goals (Bransford, Brown, & Cocking, 1999; Paas, Renkl & Sweller, 2003; Sweller, Van Merrienboer & Paas, 1998).

4.2.3.3 Involvement

Research has established that, when students are actively involved in their learning, it is more likely to be meaningful to them. According to the Curriculum Council (1998, p. 34), "Students should be encouraged to think of learning as an active process on their part, involving a conscious intention to make sense of new ideas or experiences and improve their own knowledge and capabilities, rather than simply to reproduce or remember." In addition, research evidence suggests that language plays an important part in helping students to understand what they are learning (Taylor & Campbell-Williams, 1993) and participating in classroom discussions and negotiating understandings with peers, are important aspects of the learning process. More importantly, classrooms which seek to maximise student involvement can help to focus the responsibility of learning on both the teacher and the learner as well providing an additional resource, the student themselves, as the vehicle for teaching and learning (Black & Wiliam, 2009). The Involvement scale, originally developed

for the WIHIC (Fraser et al., 1996), was selected and modified for use in the COLES, to assess the extent to which students feel that they have opportunities to participate in discussions and have attentive interest in what is happening in the classroom.

4.2.3.4 Personal Relevance

The Personal Relevance scale, derived from the CLES (Taylor et al., 1997), was modified for use in the COLES to examine the connectedness of a subject with students' out-of-school experiences. To ensure that students engage in their learning, it is necessary for teachers to make certain that the content is relevant to the students' lives outside school (Taylor et al., 1997). In this way, teachers are able to provide a meaningful context in which they can introduce new knowledge. The learning context is considered an important factor influencing student motivation and engagement, and the extent to which a student is able to make meaning from their learning experiences may be determined by how well the student perceives the experience as meeting their fundamental needs and concepts of self (Connell & Wellborn, 1991; Ryan, 1995; Ryan & Deci, 2000).

4.2.3.5 Cooperation

In developing this questionnaire, an environment in which teachers encourage a collaborative setting was considered more desirable than a competitive one (Johnson, Johnson & Smith, 2007; Tan, Sharan & Lee, 2007). Whilst it is acknowledged that students should be given opportunities to work as individuals, it was considered to be equally important that they work together collaboratively. Achievement effects have been evident in a range of schools, learning areas and across all age levels which have utilised cooperative learning strategies (Slavin, 1991). Cooperative learning strategies, particularly those which have incorporated both group goals and individual accountability, have also had consistently positive effects on self-esteem; intergroup relations; acceptance of students with special needs; attitudes towards school and the ability of students to be more effective when working in groups (Slavin, 1991). It was with this in mind that the Cooperation scale, originally developed for the WIHIC (Fraser et al., 1996), was selected and modified for use in

the COLES, to assess the extent to which students cooperate with one another in a collaborative atmosphere.

The COLES is comprised of a total of 11 scales and although such an instrument cannot be expected to assess every aspect of the learning environment, the selected scales were all considered to be highly relevant to teaching and learning environments in a range of contexts. Importantly, many of these scales have also been shown to be good predictors of student outcomes (Aldridge & Fraser, 2008).

4.3 DEVELOPMENT OF THE ASBS

The Attitudes and Self-Belief Survey (ASBS) was based on an instrument developed by Aldridge and Fraser (2008) that was used to assess student attitudes in an outcomes-based learning environment. They, along with the participants in their study felt that, although past research had shown that the learning environment is a strong predictor of student attitudes (Fraser, 2007, 2012; Walker, 2006), these attitude outcomes were often overlooked in preference to cognitive outcomes. Two distinct dimensions from this instrument were used in this study: Attitude to Subject and Academic Efficacy. Both scales were modified for use in this research. Each scale was initially comprised of eight items (16 items in total), however, as with the development of the COLES, these scales were refined in 2008. The final version of the ASBS was comprised of two scales, each with seven items (14 items in total).

4.3.1 Attitude to Subject

For the purpose of this research, a definition based on an affective component (feelings regarding the object, such as like or dislike) was adopted with the aim of examining the way in which students might regard a given subject in terms of whether it is interesting or exciting.

The Enjoyment of Science Lessons scale from the Test of Science-Related Attitudes (TOSRA: Fraser, 1978, 1981), was originally adapted for use by Aldridge and Fraser (2008). The scale, renamed Attitude to Subject, was designed to provide student self-reports about their enjoyment of a given subject. A number of changes were made to

the original scale of the TOSRA. First, the scale was developed to provide student self-reports about their enjoyment of a given subject in terms of whether it is interesting, boring, dull or exciting. Secondly, as the instrument was designed to suit a range of school subjects, the word 'science' was changed to 'in this subject'. Thirdly, all negatively worded items were removed and replaced with positively worded items and, in order to reduce confusion amongst students when completing the survey form, the wording was modified to suit a five-point frequency response format, as used in the newly developed COLES. Lastly, one item was removed from the original eight item scale and to improve readability and meaning, the wording for one item was refined.

4.3.2 Academic Efficacy

Academic efficacy is drawn out of the field of research related to self-efficacy which was a central part of Bandura's (1977) social cognitive theory. Self-efficacy refers specifically to the extent to which a student is confident in his or her ability in a particular domain. Bandura (1977) theorised that the beliefs a student holds about their capabilities can have a significant influence on aspects of behaviour that are important to learning. Past research suggests that a high self-efficacy can increase the willingness to engage and persist in challenging tasks (Pajares, 1996) and can have a positive effect on engagement, effort, persistence, goal setting and performance (Bandura, 1982, 1989; Schunk, 1989; Zimmerman, Bandura & Martinz-Pons, 1992). Students with a high level of self-efficacy are likely to put in more effort, use a broader array of strategies including strategies which consistently evaluate their progress and self-regulate their learning (Pajares, 1996; Schunk, 1989; Schunk & Pajares, 2005). Multon, Brown and Lent's (1991) meta-analysis of studies that related academic efficacy to the attainment of basic cognitive skills, coursework and standardised tests indicated that academic efficacy was a positive predictor of academic achievement. In addition, Schunk (1996) suggests that there exists a reciprocal relationship between academic efficacy, motivation and effort, whereby motivation and effort influence, and are influenced by, academic efficacy. Dorman, Fisher and Waldrip (2006) and Velayutham, Aldridge and Fraser (2011) suggest that sources of self-efficacy can be attributed to psychosocial learning environment; one

premise of this research was that student's views of their own competence could have important implications for improving learning environments and, therefore, student outcomes.

The Academic Efficacy scale, originally developed by Aldridge and Fraser (TROFLEI, 2008) was based on items drawn from the Morgan-Jinks Student Efficacy Scale (MJSES; Jinks & Morgan, 1999). This scale was used to investigate the associations between student perceptions about their competence and their perceptions of the classroom learning environment. The Academic Efficacy scale for the TROFLEI was modified further for use in the ASBS. First, the total number of items for the scale was reduced from eight to seven items and secondly; the wording for two items was refined slightly to improve readability and meaning.

4.4 VALIDATION OF INSTRUMENTS

Although most of the scales selected for use in the COLES and ASBS had been used and validated in previous studies, each was modified in various ways to suit the context and purpose of the research reported in this thesis. It was important, therefore, to ensure that the instruments were both valid and reliable. The framework for construct validity, developed by Trochim and Donnelly (2008), was used to assess how well the Constructivist-Oriented Learning Environment Survey (COLES) reflected the ideas and theoretical framework of the study. To guide the validation, I used Trochim and Donnelly's (2008) framework for construct validity, whereby an instrument or construct should fulfil the requirements of both translation validity of the COLES and ASBS (discussed in Section 4.4.1), criterion-related validity of the COLES (discussed in Section 4.4.2) and criterion-related validity of the ASBS (discussed in Section 4.4.3). All data analyses were conducted separately for each of the three years of the study.

4.4.1 Translation Validity of the COLES and ASBS

Prior to the commencement of the study, I made changes to the original items to ensure that the instruments met the needs of the participant teachers. As a first step, a review of the theoretical rationale for each of the scales (presented in the previous

sections), was used to ensure that the associated items were a good translation of the constructs (Trochim & Donnelly, 2008). At this stage, an 'expert' panel, made up of two curriculum officers and two teachers from two focus schools, were asked to scrutinise the items to ensure that they were generally reflective of the scale description and were considered useful to teachers.

The panel reported that, generally, the scales and the items included in the COLES and the ASBS included types of information that would interest a classroom teacher. They felt that, in all cases, the items in the scales were good indicators of the descriptions provided. The panel did, however, identify nine items that they considered to be problematic because they were either unclear or too similar to another item which could be an issue for students with low reading levels. They also commented that the large number of items could contribute to survey fatigue. Using this information, I worked with members from the expert panel to reduce the number of items and to improve the readability of items in each of the scales. Those items that were identified as unclear or too similar to another item in the scale (or a different scale) were omitted. The wording of items, identified by the expert panel to be problematic, were refined to improve readability. Once refined, further consultation with the panel was sought to ensure that the items were still meaningful within the context of the scale description. As a result of this consultation process, the number of items in the COLES was reduced from 88 items to 67 items (six items for each scale, except the Young Adult Ethos scale which had seven items) and the ASBS was reduced from 16 items to 14 items (seven items for each scale). Table 4.2 provides examples of the refinements and those items that were removed as a result of the consultation process.

Once confident that each of the scales was selected on a sound theoretical basis (satisfying content validity) and that the items within each scale were indicative of the construct, the surveys were administered to a group of 12 students in a mixed-ability Grade 11 class to examine whether they the interpreted items in ways that were meaningful and similar to the intentions of the researcher. In-depth, semi-structured interviews, guided by students' responses to the survey and questions based on the scale descriptions (detailed in sections 4.2 and 4.3), were conducted

with the 12 students. During the interviews, students were asked to explain why they had responded to items in the way that they did and to provide examples to substantiate their responses. The results of these interviews suggested that, in all cases, the items were interpreted in ways that were intended by the researcher, thereby supporting the face validity of both instruments.

Table 4.2 Examples of changes made to the COLES and the ASBS at the end of the first year of the research program

Scale	Original Wording	Item Refined	Example of an Removed Item
COLES Scale			
Student Cohesiveness	I make friends among students in this class.	I make new friends among students in this class.	In this class, I get help from other students.
Personal Relevance	What I learn in this class is relevant to my everyday life.	What I learn in this class is relevant to my day to day life.	I link my class work to my life outside of school.
Cooperation	I work with other students on projects in this class.	I work with other students on assignments in this class.	Students work with me to achieve class goals.
Differentiation	I work at the speed which suits my ability.	I am able to work at the speed which suits my ability.	I use different materials from those used by other students.
Formative Assessment	There is a link between classroom activities and my assessment tasks.	I can see a link between classroom activities and the assessment tasks I do.	Assessment tasks help my understanding.
Clarity of Assessment	I understand how to complete assessment tasks successfully.	I know how to complete assessment tasks successfully.	The assessment criteria are clear to me.
ASBS Scale			
Attitude to Subject	These lessons make me interested in this subject.	These lessons increase my interest in this subject.	I enjoy lessons in this subject.
Academic Efficacy	I feel that I will pass this subject with ease.	I feel that I will achieve a good result in this subject.	I feel that I am an intelligent student.

4.4.2 Criterion-Related Validity of the COLES

Criterion-related validity involves examining whether an instrument behaves the way it should, given the theory of the construct, and involves examining convergent validity (Section 4.4.2.1), discriminant validity (Section 4.4.2.2), concurrent validity (Section 4.4.2.3) and predictive validity (Section 4.4.2.4).

4.4.2.1 Convergent Validity of the COLES

Convergent validity measures the strength of the relationships between the items that are predicted to represent a single latent construct or concept (Brown, 2006). For an instrument to have convergent validity, a given set of items within a construct must be strongly related to one another and represent only one factor. To examine the convergent validity of the COLES, factor analysis and scale reliability estimates were used.

Factor Structure of COLES

Factor analysis was used to provide a means of determining whether items within the same scale were tapping into the same construct and whether each scale was assessing a distinct construct. Principal axis factor analysis with oblique rotation and Kaiser normalisation was used to examine the factor structure for the actual and preferred versions separately for each of the three years (Brown, 2006; Costello & Osborne, 2005; Field, 2005). The criteria for retaining any item was that it must have a factor loading of at least 0.40 on its own scale and less than 0.40 on any of the other scales (Field, 2005; Thompson, 2004; Stevens, 1992).

The factor loadings, eigenvalue and percentage of variance for the actual version are reported separately for each year of the study in Table 4.3. For all three years, all items (with the exceptions of three) had a loading of at least 0.40 on their *a priori* scale and no other scale. The three exceptions were Item 32 for the Clarity of Assessment scale (2010 only), Item 49 for Task Orientation (2008 only) and Item 62 for the Differentiation scale (all three years). All three items did not load on their own or any other scale. Although Item 62 did not load on its own scale for any of the three years, further analyses indicated that, by omitting this item, the reliability estimates for this scale would be reduced. As the item also did not load on any other scale, a decision was made to retain it. For the actual version, the percentage of variance ranged from 1.17% to 26.02% for different scales, with the total variance accounted for being 70.19% in 2008, 68.63% in 2009 and 64.32% in 2010 (reported at the bottom of Table 4.3).

Table 4.3 Factor loadings for the Actual Version of the COLES for 2008, 2009 and 2010

Item No	Factor Loading																														
	RELATIONSHIPS												ASSESSMENT						DELIVERY												
	Student Cohesiveness			Teacher Support			Equity			Young Adult Ethos			Formative Assessment			Clarity of Assessment			Involvement			Task Orientation			Personal Relevance			Cooperation			Differentiation		
	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
1	0.80	0.81	0.75																												
2	0.72	0.72	0.66																												
3	0.75	0.76	0.74																												
4	0.62	0.57	0.57																												
5	0.56	0.62	0.69																												
6	0.73	0.62	0.80																												
7				0.66	0.68	0.64																									
8				0.71	0.64	0.69																									
9				0.75	0.73	0.67																									
10				0.72	0.71	0.66																									
11				0.71	0.74	0.65																									
12				0.60	0.62	0.61																									
13							0.63	0.66	0.62																						
14							0.70	0.68	0.74																						
15							0.77	0.74	0.83																						
16							0.68	0.67	0.66																						
17							0.77	0.75	0.76																						
18							0.74	0.72	0.77																						
19										0.64	0.68	0.44																			
20										0.71	0.74	0.78																			
21										0.75	0.73	0.79																			
22										0.75	0.76	0.75																			
23										0.80	0.79	0.82																			
24										0.79	0.75	0.80																			
25										0.75	0.71	0.60																			
26													0.56	0.58	0.66																
27													0.59	0.61	0.70																
28													0.52	0.55	0.53																
29													0.79	0.79	0.76																
30													0.74	0.76	0.72																
31													0.75	0.75	0.71																
32																0.57	0.56	-													
33																0.73	0.75	0.63													
34																0.77	0.79	0.74													
35																0.80	0.81	0.76													
36																0.68	0.62	0.49													
37																0.81	0.76	0.72													

Item No	Factor Loading																														
	RELATIONSHIPS												ASSESSMENT						DELIVERY												
	Student Cohesiveness			Teacher Support			Equity			Young Adult Ethos			Formative Assessment			Clarity of Assessment			Involvement			Task Orientation			Personal Relevance			Cooperation			Differentiation		
	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
38																			0.76	0.76	0.83												
39																			0.84	0.81	0.87												
40																			0.60	0.59	0.64												
41																			0.72	0.71	0.80												
42																			0.66	0.61	0.72												
43																			0.59	0.56	0.68												
44																						0.58	0.64	0.61									
45																						0.68	0.68	0.71									
46																						0.53	0.50	0.56									
47																						0.69	0.69	0.72									
48																						0.58	0.63	0.68									
49																						-	0.49	0.54									
50																									0.77	0.74	0.73						
51																									0.88	0.89	0.87						
52																									0.82	.078	0.78						
53																									0.88	0.89	0.86						
54																									0.81	0.77	0.82						
55																									0.73	0.67	0.58						
56																												0.76	0.77	0.74			
57																												0.66	0.70	0.71			
58																												0.72	0.72	0.70			
59																												0.73	0.75	0.68			
60																												0.73	0.76	0.71			
61																												0.71	0.71	0.66			
62																															-	-	-
63																															0.57	0.58	0.69
64																															0.79	0.74	0.73
65																															0.57	0.61	0.59
66																															0.49	0.47	0.54
67																															0.62	0.56	0.69
% Variance	3.02	1.72	1.92	2.33	1.39	2.89	1.79	1.82	1.49	1.42	1.55	1.84	1.10	24.32	1.25	26.02	1.17	20.09	1.67	4.31	4.36	1.51	1.48	1.38	4.14	3.16	3.65	1.24	2.35	1.61	2.11	2.02	2.08
Eigenvalue	4.57	2.60	2.91	3.54	2.10	4.38	2.71	2.76	2.26	2.15	2.35	2.78	1.66	36.86	1.89	39.42	1.77	30.44	2.53	6.53	6.60	2.29	2.24	2.09	6.27	4.80	5.37	1.88	3.56	2.44	3.12	3.06	3.15

Factor loadings smaller than 0.40 have been omitted.
The sample consisted of 2042 students in 147 classes in 2008, 4467 students in 298 classes in 2009 and 3836 students in 239 classes in 2010.

Table 4.4 Factor Loadings for the Preferred Version of the COLES for 2008, 2009 and 2010

Item No	Factor Loading																													
	RELATIONSHIPS												ASSESSMENT						DELIVERY											
	Student Cohesiveness			Teacher Support			Equity			Young Adult Ethos			Formative Assessment			Clarity of Assessment			Involvement			Task Orientation			Personal Relevance			Cooperation			Differentiation		
	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
1	0.78	0.83	0.79																											
2	0.74	0.79	0.78																											
3	0.73	0.78	0.69																											
4	0.75	0.63	0.65																											
5	0.67	0.70	0.70																											
6	0.73	0.71	0.77																											
7				0.68	0.72	0.67																								
8				0.67	0.64	0.65																								
9				0.74	0.78	0.75																								
10				0.76	0.75	0.72																								
11				0.75	0.80	0.70																								
12				0.61	0.67	0.65																								
13							0.70	0.70	-																					
14							0.70	0.69	0.70																					
15							0.82	0.76	0.77																					
16							0.81	0.71	0.75																					
17							0.80	0.76	0.79																					
18							0.80	0.74	0.76																					
19										0.67	0.71	0.50																		
20										0.75	0.81	0.81																		
21										0.75	0.79	0.80																		
22										0.69	0.73	0.71																		
23										0.79	0.74	0.78																		
24										0.78	0.77	0.78																		
25										0.75	0.73	0.62																		
26													0.49	0.51	0.65															
27													0.54	0.54	0.76															
28													0.43	0.47	0.62															
29													0.74	0.69	0.67															
30													0.68	0.70	0.72															
31													0.75	0.70	0.71															
32																0.64	0.56	0.54												
33																0.65	0.67	0.61												
34																0.74	0.73	0.76												
35																0.72	0.70	0.75												
36																0.73	0.66	0.68												
37																0.79	0.71	0.67												

Item No	Factor Loading																														
	RELATIONSHIPS												ASSESSMENT						DELIVERY												
	Student Cohesiveness			Teacher Support			Equity			Young Adult Ethos			Formative Assessment			Clarity of Assessment			Involvement			Task Orientation			Personal Relevance			Cooperation			Differentiation		
	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
38																			0.72	0.73	0.80												
39																			0.81	0.80	0.86												
40																			0.69	0.75	0.79												
41																			0.79	0.76	0.83												
42																			0.68	0.68	0.76												
43																			0.61	0.68	0.78												
44																						0.62	0.74	0.69									
45																						0.66	0.72	0.70									
46																						0.55	0.60	0.59									
47																						0.73	0.80	0.73									
48																						0.71	0.74	0.69									
49																						0.66	0.74	0.66									
50																									0.79	0.78	0.79						
51																									0.88	0.87	0.92						
52																									0.84	0.83	0.85						
53																									0.88	0.90	0.89						
54																									0.85	0.83	0.84						
55																									0.79	0.76	0.64						
56																												0.79	0.81	0.84			
57																												0.62	0.64	0.71			
58																												0.77	0.73	0.80			
59																												0.72	0.76	0.74			
60																												0.76	0.80	0.70			
61																												0.66	0.73	0.68			
62																															-	-	-
63																															0.52	0.53	0.65
64																															0.84	0.79	0.77
65																															0.73	0.72	0.74
66																															0.62	0.60	0.64
67																															0.59	0.55	0.71
% Variance	2.26	4.50	3.54	2.74	2.85	2.72	1.31	20.95	1.19	2.06	1.70	1.39	1.36	1.43	1.55	22.64	2.04	19.90	1.21	1.55	2.14	1.74	1.32	1.35	3.50	3.61	1.71	4.25	1.24	4.15	1.79	1.86	1.87
Eigenvalue	1.49	6.81	5.36	4.15	4.32	4.12	1.98	31.75	1.81	3.12	2.58	2.11	2.07	2.17	2.35	34.30	3.08	30.14	1.84	2.34	3.24	2.63	2.00	2.04	5.31	5.46	2.59	6.43	1.87	6.28	2.71	2.82	2.84

Factor loadings smaller than 0.40 have been omitted.
The sample consisted of 2042 students in 147 classes in 2008, 4467 students in 298 classes in 2009 and 3836 students in 239 classes in 2010.

The factor loadings, percentage of variance and eigenvalues for the preferred version are reported in Table 4.4. For the preferred version, all items with the exception of Item 13 for the Equity scale (2010 only) and Item 62 for the Differentiation scale (all three years) had a loading of at least 0.40 on their *a priori* scales and no other scale. As with the actual version, the decision to retain Item 62, despite it not loading on its own scale, was made. These two items did not load on their own scale or any other scale. For the preferred version, the percentage of variance ranged from 1.19% to 22.64% for different scales, with the total variance accounted for being 66.80% in 2008, 65.20% in 2009 and 62.87% in 2010 (reported at the bottom of Table 4.4).

Internal consistency reliability of the COLES

The internal consistency reliability of each COLES scale was estimated using Cronbach's alpha coefficient for two units of analysis (the individual student and the class mean). These estimates are reported separately for each year (2008, 2009 and 2010), for both the actual and preferred versions in Table 4.5.

Using the individual as the unit of analysis, scale reliability estimates for the actual form ranged from 0.74 to 0.92 in 2008, 0.70 to 0.93 in 2009 and 0.80 to 0.92 in 2010. For the preferred form, scale reliabilities ranged from 0.75 to 0.92 in 2008, 0.73 to 0.92 in 2009 and 0.80 to 0.92 in 2010.

Generally reliability figures were higher with the class mean as the unit of analysis. For the actual form, scale reliabilities ranged from 0.83 to 0.97 in 2008, 0.79 to 0.97 in 2009 and 0.84 to 0.97 in 2010. For the preferred form, scale reliabilities ranged from 0.76 to 0.96 in 2008, 0.75 to 0.96 in 2009 and 0.74 to 0.96 in 2010. According to Cohen, Manion and Morrison (2000), the alpha coeffect for a satisfactory scale should be 0.70 or higher. Given this, these alpha reliability estimates support the internal consistency of all scales of the COLES for each year of administration for both the actual and preferred versions.

Table 4.5 Internal consistency reliability (Cronbach alpha coefficient) for actual and preferred responses version of the COLES

COLES Scale	Unit of Analysis	Alpha Reliability					
		Actual			Preferred		
		2008	2009	2010	2008	2009	2010
Relationships							
Student Cohesiveness	Individual	0.85	0.85	0.82	0.88	0.88	0.85
	Class Mean	0.89	0.90	0.88	0.92	0.92	0.90
Teacher Support	Individual	0.91	0.90	0.90	0.88	0.88	0.87
	Class Mean	0.96	0.96	0.96	0.93	0.92	0.91
Equity	Individual	0.92	0.93	0.92	0.92	0.91	0.90
	Class Mean	0.97	0.97	0.97	0.95	0.96	0.94
Young Adult Ethos	Individual	0.92	0.90	0.89	0.92	0.90	0.89
	Class Mean	0.96	0.95	0.94	0.96	0.94	0.91
Assessment							
Formative Assessment	Individual	0.90	0.88	0.86	0.90	0.89	0.88
	Class Mean	0.94	0.94	0.92	0.95	0.94	0.92
Clarity of Assessment	Individual	0.90	0.90	0.87	0.92	0.92	0.89
	Class Mean	0.95	0.95	0.92	0.96	0.97	0.95
Delivery							
Involvement	Individual	0.87	0.86	0.90	0.90	0.90	0.92
	Class Mean	0.91	0.90	0.94	0.93	0.93	0.96
Task Orientation	Individual	0.84	0.82	0.83	0.88	0.88	0.87
	Class Mean	0.88	0.88	0.84	0.93	0.94	0.91
Personal Relevance	Individual	0.91	0.90	0.90	0.92	0.92	0.92
	Class Mean	0.95	0.95	0.93	0.96	0.95	0.94
Cooperation	Individual	0.88	0.87	0.83	0.89	0.89	0.87
	Class Mean	0.94	0.93	0.86	0.94	0.93	0.92
Differentiation	Individual	0.74	0.70	0.80	0.75	0.73	0.80
	Class Mean	0.83	0.79	0.84	0.76	0.75	0.74

The sample consisted of 2042 students in 147 classes in 2008, 4467 students in 298 classes in 2009 and 3836 students in 239 classes in 2010.

4.4.2.2 Discriminant Validity of the COLES

Discriminant validity assesses the extent to which a scale is unique in the dimension that it covers (i.e. the construct is not included in the other scale of the instrument). Trochim and Donnelly (2008) suggest that discriminant validity is achieved when correlations between a particular item and other items in the same construct are higher than correlations between items from different constructs. A component

correlation matrix, obtained from oblique rotation, was generated for each of the three years for the actual version of the COLES. While Field (2005) suggests that there should be a moderate relationship between factors, according to Brown (2006), factor correlations above 0.80 suggest an overlap of concepts and possibly poor discriminant validity.

Table 4.6 Component correlation matrix for the COLES for 2008 data

COLES Scale	SC	TS	E	YAE	FA	CA	I	TO	PR	CO
Student Cohesiveness (SC)	-									
Teacher Support (TS)	0.38	-								
Equity (E)	-0.39	-0.33	-							
Young Adult Ethos (YAE)	-0.36	-0.24	0.39	-						
Formative Assessment (FA)	0.50	0.36	-0.33	-0.47	-					
Clarity of Assessment (CA)	0.45	0.33	-0.30	-0.23	0.37	-				
Involvement (I)	0.26	0.38	-0.46	-0.37	0.20	0.20	-			
Task Orientation (TO)	0.28	0.55	-0.21	-0.22	0.30	0.32	0.38	-		
Personal Relevance (PR)	0.24	0.25	-0.42	-0.26	0.32	0.10	0.25	0.16	-	
Cooperation (C)	-0.60	-0.39	0.39	0.46	-0.51	-0.31	-0.34	-0.31	-0.33	-
Differentiation (D)	0.47	0.28	-0.31	-0.61	0.54	0.32	0.23	0.24	0.18	-0.53

The sample consisted of 2042 students in 147 classes in 2008.

Table 4.7 Component correlation matrix for the COLES for 2009 data

COLES Scale	SC	TS	E	YAE	FA	CA	I	TO	PR	CO
Student Cohesiveness (SC)	-									
Teacher Support (TS)	0.25	-								
Equity (E)	0.24	0.20	-							
Young Adult Ethos (YAE)	0.31	0.32	0.29	-						
Formative Assessment (FA)	-0.52	-0.27	-0.36	-0.31	-					
Clarity of Assessment (CA)	-0.23	-0.39	-0.42	-0.18	0.29	-				
Involvement (I)	0.60	0.30	0.32	0.42	-0.54	-0.21	-			
Task Orientation (TO)	0.14	0.07	0.35	0.11	-0.29	-0.24	0.28	-		
Personal Relevance (PR)	-0.31	-0.57	-0.29	-0.32	0.28	0.37	-0.33	-0.21	-	
Cooperation (C)	-0.58	-0.22	-0.30	-0.20	0.42	0.35	-0.46	-0.19	0.21	-
Differentiation (D)	0.42	0.30	0.38	0.45	-0.59	-0.25	0.53	0.24	-0.36	-0.33

The sample consisted of 4467 students in 298 classes in 2009.

Table 4.8 Component correlation matrix for the COLES for 2010 data

COLES Scale	SC	TS	E	YAE	FA	CA	I	TO	PR	CO
Student Cohesiveness (SC)	-									
Teacher Support (TS)	0.19	-								
Equity (E)	0.10	0.43	-							
Young Adult Ethos (YAE)	0.15	0.20	0.26	-						
Formative Assessment (FA)	-0.31	-0.23	-0.20	-0.24	-					
Clarity of Assessment (CA)	-0.28	-0.39	-0.35	-0.17	0.35	-				
Involvement (I)	-0.27	-0.31	-0.18	-0.31	0.38	0.40	-			
Task Orientation (TO)	-0.40	-0.26	-0.29	-0.42	0.42	0.22	0.34	-		
Personal Relevance (PR)	0.25	0.27	0.08	0.15	-0.34	-0.25	-0.45	-0.22	-	
Cooperation (C)	-0.55	-0.24	-0.23	-0.29	0.45	0.31	0.24	0.58	-0.17	-
Differentiation (D)	-0.35	-0.24	-0.23	-0.44	0.52	0.30	0.40	0.50	-0.28	0.42

The sample consisted of 3836 students in 239 classes in 2010.

The component correlation matrix for 2008, 2009 and 2010 are reported in Tables 4.6, 4.7 and 4.8, respectively. These data indicate that while scores on the COLES assess somewhat overlapping aspects of learning environment, the highest correlation reported was 0.61 and this value met the requirements of discriminant validity according to Brown (2006).

4.4.2.3 Concurrent Validity of the COLES

Concurrent validity examines whether a construct is able to distinguish between those groups it was expected to distinguish between. In this case, while students within a particular classroom can be expected to perceive the learning environment in a similar way, it was anticipated that the class mean would vary between classrooms. In order to assess concurrent validity, a one-way analysis of variance (ANOVA), with class membership as the independent variable, was computed to determine the degree to whether each COLES scale was able to differentiate between the perceptions of students in different classes. The proportion of variance accounted for by class membership was calculated using the eta^2 statistic (the ratio of 'between' to 'total' sums of squares).

The results reported in Table 4.9 show that all 11 COLES scales differentiated significantly between classes ($p<0.01$), that is, students within the same class perceived the environment in a relatively similar manner, while the within-class

mean perceptions of the students varied between classes. The eta^2 statistic (an estimate of the strength of association between class membership and the dependent variable) for different COLES scales ranged from 0.14 to 0.31 in 2008, 0.13 to 0.30 in 2009 and 0.13 to 0.30 in 2010.

Table 4.9 Ability to differentiate between classrooms (ANOVA results) for the actual version of the COLES

	ANOVA Eta^2		
COLES Scale	2008	2009	2010
Relationships			
Student Cohesiveness	0.14**	0.17**	0.19**
Teacher Support	0.31**	0.30**	0.27**
Equity	0.23**	0.24**	0.28**
Young Adult Ethos	0.20**	0.19**	0.30**
Assessment			
Formative Assessment	0.17**	0.17**	0.18**
Clarity of Assessment	0.18**	0.19**	0.23**
Delivery			
Involvement	0.17**	0.15**	0.20**
Task Orientation	0.15**	0.13**	0.13**
Personal Relevance	0.22**	0.20**	0.23**
Cooperation	0.18**	0.16**	0.19**
Differentiation	0.20**	0.17**	0.19**

** $p<0.01$
The sample consisted of 10,345 students in 684 classes over a three-year period 2008 - 2010.
The eta^2 statistic (which is the ratio of 'between' to 'total' sums of squares) represents the proportion of variance explained by class membership.

4.4.2.4 Predictive Validity of the COLES

Past research has shown that the learning environment is a strong predictor of student attitudes (Aldridge & Fraser, 2008; Fraser, 2007, 2012; Walker, 2006). To assess predictive validity of the COLES and any associations between the learning environment and student attitudes, correlations between the scales of the COLES and the ASBS for the pre-test were examined using a two-tailed Pearson coefficient, the results of which are reported in Table 4.10.

The results indicate that, for all 11 scales of the COLES, there was a statistically significant correlation with each of the two scales of the ASBS. These results support the predictive validity of the 11 scales of the COLES.

Table 4.10 Pearson Correlation showing the relationship between scales in the COLES and the ASBS

	Pearson Correlation (Two-tailed)					
	Student Enjoyment			Academic Efficacy		
COLES Scale	2008	2009	2010	2008	2009	2010
Relationships						
Student Cohesiveness	0.24*	0.18*	0.20*	0.19*	0.15*	0.22*
Teacher Support	0.51*	0.48*	0.52*	0.26*	0.28*	0.27*
Equity	0.47*	0.43*	0.44*	0.23*	0.21*	0.24*
Young Adult Ethos	0.41*	0.42*	0.42*	0.24*	0.26*	0.23*
Assessment						
Formative Assessment	0.45*	0.44*	0.44*	0.25*	0.30*	0.30*
Clarity of Assessment	0.49*	0.48*	0.49*	0.40*	0.43*	0.41*
Delivery						
Involvement	0.41*	0.35*	0.38*	0.42*	0.37*	0.40*
Task Orientation	0.40*	0.42*	0.44*	0.28*	0.36*	0.34*
Personal Relevance	0.51*	0.47*	0.49*	0.38*	0.38*	0.36*
Cooperation	0.34*	0.27*	0.35*	0.21*	0.18*	0.28*
Differentiation	0.44*	0.44*	0.52*	0.42*	0.40*	0.50*

*$p<0.01$

Overall, the results, presented in Section 4.4.2, strongly support the validity and reliability of the COLES when used with high school students in Western Australia. As such, the results derived from the COLES to address the ensuing research questions, can be interpreted with confidence. Furthermore, teachers using the COLES as a tool to collect data from their students can be assured of its reliability. Therefore, the COLES adds to the suite of instruments which can be used by teachers with confidence to assess the classroom learning environment.

4.4.3 Reliability and Validity of the ASBS

Although four validity types were used to assess the COLES, as the ASBS measures students' views of their own competency and attitudes, it was appropriate to examine

only the convergent validity (Section 4.4.3.1) and discriminant validity (Section 4.4.3.2).

4.4.3.1 Convergent Validity of the ASBS

To examine the convergent validity of the ASBS, principal axis factor analysis with oblique rotation and Kaiser normalisation was used to examine the factor structure of the ASBS. Factor analysis supported the two-scale *a priori* structure of the ASBS. The two criteria used for retaining any item were that it must have a factor loading of at least 0.40 on its own scale and not any others. Table 4.11 reports the factor loadings and percentage of variance for each scale for the ASBS.

All 14 items had a loading of at least 0.40 on their *a priori* scale and no other scale. The percentage of variance was 2.40% and 8.14% for the two scales, with the total variance accounted for being 75.37% in 2008, 74.31% in 2009 and 74.57% in 2010 (see Table 4.11).

As a further measure of convergent validity, the internal consistency of each scale in the ASBS, using Cronbach's alpha coefficient for two units of analysis (the individual student and the class mean) was calculated (reported in Table 4.12). Using the individual as the unit of analysis, scale reliability estimates were high, ranging from 0.92 to 0.96 in 2008, 0.93 to 0.95 in 2009 and 0.92 to 0.96 in 2010. Using the class mean as the unit of analysis, scale reliabilities ranged from 0.95 to 0.98 in 2008 and 2009; and 0.94 to 0.98 in 2010. These results support the internal consistency of the two scales for the ASBS over multiple times of administration.

Table 4.11 Factor loadings for responses to the ASBS over three years (2008-2010)

Item No	Factor Loading					
	Attitude to Subject			Academic Efficacy		
	2008	2009	2010	2008	2009	2010
1	0.90	0.86	0.89			
2	0.89	0.89	0.91			
3	0.86	0.85	0.84			
4	0.91	0.91	0.89			
5	0.73	0.75	0.76			
6	0.89	0.91	0.89			
7	0.94	0.93	0.89			
8				0.81	0.82	0.84
9				0.83	0.83	0.78
10				0.72	0.71	0.75
11				0.88	0.87	0.84
12				0.86	0.88	0.86
13				0.90	0.88	0.81
14				0.59	0.61	0.70
% Variance	8.14	7.99	8.04	2.42	2.42	2.40
Eigenvalue	58.12	57.05	57.01	17.25	17.25	17.16

The sample consisted of 2042 students in 147 classes in 2008, 4467 students in 298 classes in 2009 and 3836 students in 239 classes in 2010.

4.4.3.2 Discriminant Validity of the ASBS

To examine the discriminant validity of the scales of the ASBS, the correlation of one scale with another was used. For the individual as the unit of analysis, the correlation was 0.54 for all three years. For the class mean as the unit of analysis, the correlation was 0.51 in 2008, 0.55 in 2009 and 0.58 in 2010. Although these correlations suggest a degree of overlap between the two scales, the factor analysis (reported in Table 4.11) suggests that the two scales assessed somewhat unique dimensions.

Overall, these results provide strong support the reliability and validity of the ASBS when used with high school students in Western Australia. These results replicate past findings of the original survey developed by Aldridge and Fraser (2008).

Table 4.12 Internal consistency reliability (Cronbach alpha coefficient) for the ASBS

ASBS Scale	Unit of Analysis	Alpha Reliability			Mean Correlation with other Scales		
		2008	2009	2010	2008	2009	2010
Attitude to Subject	Individual	0.96	0.95	0.96	0.54	0.54	0.54
	Class Mean	0.98	0.98	0.98	0.51	0.55	0.58
Academic Efficacy	Individual	0.92	0.93	0.92	0.54	0.54	0.54
	Class Mean	0.95	0.95	0.94	0.51	0.55	0.58

The sample consisted of 2042 students in 147 classes in 2008, 4467 students in 298 classes in 2009 and 3836 students in 239 classes in 2010.

4.5 CHAPTER SUMMARY

One of the main activities of this research involved the development of two instruments, the Constructivist-Oriented Learning Environment Survey (COLES) and the Attitudes and Self Belief Survey (ASBS). To ensure that teachers could be confident in the feedback and to the support subsequent aims of the research, it was important to establish the reliability and validity of both instruments. The reliability and validity of the instruments were assessed using a framework for construct validity, developed by Trochim and Donnelly (2008), in which both 'translation' validity and 'criterion-related' validity should be fulfilled.

As a first step, to ensure translation validity (comprised of face and content validity), a consultation process was undertaken during the first year whereby the two instruments were subject to scrutiny by an 'expert' panel comprised of myself, two teachers and two curriculum leaders from two of the focus schools. As a result, the initial versions of the COLES and ASBS were refined to address issues of readability and survey fatigue. This process helped to ensure that the items described the concept being assessed and that, overall, the constructs had a sound theoretical basis. To further assess face validity, interviews with 12 students were used to confirm that the meaning of the items was being interpreted in ways intended by the researcher.

The criterion-related validity, of the instruments was examined using the sample of 10,345 students' responses to the COLES and the ASBS, collected over three years (n=147 classes for 2008, 298 classes in 2009 and 239 classes in 2010) to ensure

convergent, discriminant, concurrent and predictive validity for the COLES and, for the ASBS, convergent and discriminant validity. The analysis of data collected for the COLES and the ASBS indicated satisfactory factorial validity and internal consistency, this confirmed that items within each scale for the COLES and the ASBS were tapping into the same construct and that each scale assessed a distinct construct, thereby ensuring both convergent and discriminant validity.

Concurrent validity was assessed using a one-way analysis of variance (ANOVA) which showed that each scale for the COLES was able to differentiate between the perceptions of the students in different classrooms and in assessing predictive validity, there was also a statistically significant correlation between the COLES and the ASBS that provides further support to past research which has reported strong associations between the learning environment and student attitudes (Aldridge & Fraser, 2008; Fraser, 2007, 2012; Walker, 2006).

The results presented in this chapter support the COLES and the ASBS as valid and reliable instruments for assessing students' perceptions of classroom psychosocial environments, their attitudes and academic self-efficacy beliefs at the secondary high school level. The ways in which teachers are able to utilise student feedback derived from the COLES and the ASBS to guide their improvements their respective classroom learning environments are discussed in the next chapter.

CHAPTER 5

DATA ANALYSIS, RESULTS AND FINDINGS

Using Student Perception Data to Guide Teacher Action Research

5.1 INTRODUCTION

Whereas the purpose of the previous chapter was to report the validation of the two instruments developed as part of the research program, the COLES and the ASBS, this chapter describes how teachers and schools used student feedback, generated using the two instruments, to improve the classroom learning environment. Over the three years of the research program, 459 of the 548 teachers were involved in a pre–post component. To address one of the research questions, for Part A of the research program, this pre–post sample was used to investigate whether teachers' reflection on the data, generated using the COLES and the ASBS, led to improvements in students' perceptions (Research Question 2).

In addition to the quantitative data collected using the two instruments, other sources of information were gathered, including unstructured and semi-structured interviews, field notes, written reports, summaries, reflective journals and teacher evaluation feedback (detailed previously in Chapter 3). This information were analysed, using grounded theory methods (Strauss & Corbin, 1990), to investigate: 1) how teachers used feedback from their students to guide their improvements to the classroom learning environment and implement strategies which target issues related to students' attitudes and academic self-efficacy beliefs (Research Question 3); 2) whether teachers considered the use of action research, based on student perception data, to be a worthwhile model for teacher professional development (Research Question 4); and 3) the way one school utilised student perception data for teacher professional development and to support initiatives for school improvement (Research Question 5).

Much of this qualitative information was gathered from the 45 focus teachers (12 teachers in 2008, 13 teachers in 2009 and 20 teachers in 2010) who volunteered to be part of the research program and, as some of the teachers elected to focus on more than one class, their 52 classes (15 focus classes in 2008 and 2009 and 22 focus classes in 2010). Other qualitative information, in the form of open-ended questions, was gathered from the teacher evaluation group, which was comprised of 129 teacher responses (7 teacher responses in 2008, 44 teacher responses in 2009 and 78 teacher responses in 2010).

Information collected from the critical instance case study school was used to examine the ways in which the school used the student perception data as part of their initiatives for school improvement. Qualitative information included written reports and interviews from focus teachers, interviews with members of the school leadership team, field notes (documenting informal discussions with teacher and student participants) and school planning and reporting documents. These sources of information were used to examine the ways the school utilised student perception data as part of their school improvement initiatives (which specifically targeted teacher professional development). In addition, quantitative data, involving a total of 729 student responses (192 student responses in 2008, 290 student responses in 2009 and 247 student responses in 2010) in 64 classes (18 classes in 2008, 25 classes in 2009 and 21 classes in 2010) were used to examine school-level changes over the period of research.

This chapter reports how the student perception data, gathered during Part A of the research program, was used by teachers and schools, under the following headings:

- Pre–Post Changes in Students' Perceptions of their Classroom Learning Environments (Section 5.2);
- Using Student Perception Data to Guide Improvements to the Classroom (Section 5.3);
- Student Perception Data, Teacher Action Research and School Improvement (Section 5.4); and
- Chapter Summary (Section 5.5).

5.2 PRE–POST CHANGES IN STUDENTS' PERCEPTIONS OF THEIR CLASSROOM LEARNING ENVIRONMENTS

The second research question aimed to investigate the extent to which the teachers' reflections on their student feedback initiated improvements to the classroom learning environment. As outlined in Chapter 1, the COLES and ASBS were administered to the students in classes selected by the teachers. Based on the students' responses to the two instruments, the teachers were provided with a range of feedback information and given an opportunity to implement strategies aimed at improving the environment. After a six to eight week period, during which interventions were implemented, the two surveys were re-administered to the same classes. To address Research Question 2, only students present for both the pre-test and post-test were included in the analyses.

Over the three-year period, 459 teachers were involved in this pre–post component, providing a sample of 6107 student responses (1182 student responses in 2008, 2749 student responses in 2009 and 2176 student responses in 2010) in 560 classes (122 classes in 2008, 248 classes in 2009 and 190 classes in 2010). This sample was used to investigate whether teachers were able to make use of student feedback (based on responses to the two instruments) to develop and implement strategies that improve students' perceptions (Research Question 2). This section reports the pre–post changes for the whole sample (Section 5.2.1) and a comparison of the pre–post changes made for teachers who used the feedback as a tool for reflection-only and those, focus teachers, who used the feedback as part of an action research process (Section 5.2.1).

5.2.1 Pre–Post Changes: Whole Sample

To examine whether differences between pre-test and post-test scores were statistically significant, multivariate analysis of variance (MANOVA) with repeated measures (using the class mean as the unit of analysis) was used. When the multivariate test (Wilks' lambda) revealed significant pre–post differences overall, the ANOVA with repeated measures was interpreted for each COLES and ASBS scale. The results, reported in Table 5.1, indicate that there were statistically

significant ($p<0.01$) pre–post differences for eight of the eleven COLES scales, namely, Student Cohesiveness, Teacher Support, Young Adult Ethos, Clarity of Assessment, Involvement, Personal Relevance, Cooperation and Differentiation. For both scales of the ASBS, the pre–post differences were statistically significant ($p<0.05$). In all cases, the scores (average item mean) for those scales with a statistically significant difference were higher for the post-test than for the pre-test, indicating an improvement in learning environment perceptions, students' attitudes and academic self-efficacy beliefs.

Table 5.1 Average item mean, average item standard deviation, effect size and MANOVA results for differences between pre-test and post-test scores using the class mean as the unit of analysis

Scale	Average Item Mean[a]		Average Item Standard Deviation		Difference	
	Pre-test	Post-test	Pre-test	Post-test	Effect Size	*F*
COLES Scales						
Relationships						
Student Cohesiveness	4.18	4.25	0.29	0.30	0.12	2.70**
Teacher Support	3.88	3.95	0.49	0.50	0.07	2.33**
Equity	4.10	4.09	0.46	0.48	-0.01	0.89
Young Adult Ethos	4.16	4.21	0.38	0.38	0.07	2.03**
Assessment						
Formative Assessment	3.96	3.97	0.36	0.41	0.01	0.94
Clarity of Assessment	3.86	3.96	0.40	0.38	0.13	2.74**
Delivery						
Involvement	3.29	3.49	0.40	0.42	0.24	3.65**
Task Orientation	4.03	4.02	0.29	0.35	-0.02	0.68
Personal Relevance	3.22	3.41	0.52	0.49	0.18	3.28**
Cooperation	3.78	3.83	0.38	0.41	0.06	1.99**
Differentiation	3.38	3.48	0.39	0.44	0.12	2.74**
ASBS Scales						
Attitude to Subject	3.32	3.37	1.09	1.13	0.02	6.44*
Academic Efficacy	3.16	3.25	0.93	0.99	0.05	27.74**

*$p<0.05$, **$p<0.01$
N= 560 classes.
[a] Average item mean=Scale mean divided by the number of items in that scale.

To examine the magnitudes of these pre–post differences, as recommended by Thompson (2001), the effect sizes were calculated in terms of the differences in means divided by the pooled standard deviation. The effect sizes for those scales for the COLES with statistically significant differences, reported in Table 5.1, ranged between 0.06 and 0.18 of a standard deviation. The effect sizes for the two scales of the ASBS ranged between 0.02 and 0.05 standard deviation. According to Cohen's (1992) criteria, these results suggest moderately important educationally differences between learners' perceptions of the classroom learning environment, students' attitudes and academic self-efficacy beliefs before and after the teachers' reflection on the feedback data. These findings replicate past research in which the use of students' perceptions have been successful in stimulating improvements in classroom environments (Aldridge & Fraser, 2008; Aldridge, Fraser & Ntuli, 2009; Aldridge, Fraser & Sebela, 2004; Fraser & Fisher, 1986; Sinclair & Fraser, 2002; Thorp, Burden & Fraser, 1994; Yarrow et al., 1997).

5.2.2 Pre–Post Changes: Comparing Reflection-only and Focus Teachers

Whereas the last section reports the differences for the group as a whole, this section examines whether there were differences in improvement for teachers who used the data for reflection purposes only (n=414) and for those who volunteered to be part of the focus group of teachers (n=45). These focus teachers agreed to be monitored during the action research process and, unlike the 'reflection-only' teachers, they agreed to participate more formally, engaging in a range of activities related to the action research component and to use a journal, in which they recorded the strategies that they intended to use and the outcomes of using these strategies as they implemented them in their classrooms (Details pertaining to the differences between reflection-only teachers and the focus teachers are detailed in Section 3.3.3).

As there were no significant differences, for any of the scales, for the pre-test scores for the reflection-only teachers and the focus teachers, it was considered acceptable to examine only the differences between the post-test scores for students' perceptions of the actual learning environment for each group. To investigate whether pre–post improvements in students' perceptions differed for teachers who used student

feedback for reflection-only and those who used feedback as part of a more formalised action research process, MANOVA with repeated measures (using the class mean as the unit of analysis) was used. When the multivariate test (Wilks' lambda) revealed significant post-test differences overall, the ANOVA was interpreted for each scale. Table 5.2 reports the average item mean, average item standard deviation and differences in terms of effect size and statistical significance.

Table 5.2 Average item mean, average item standard deviation, effect size and MANOVA results (using the class mean as the unit of analysis) for differences between the post-test scores for refection-only and focus teachers.

Scale	Average Item Mean[a]		Average Item Standard Deviation		Difference	
	Reflection-Only	Focus Teachers	Reflection-Only	Focus Teachers	Effect Size	*F*
COLES Scales						
Relationships						
Student Cohesiveness	4.25	4.27	0.30	0.26	0.04	0.80
Teacher Support	3.94	4.09	0.50	0.48	0.15	1.45*
Equity	4.07	4.25	0.48	0.39	0.20	1.77**
Young Adult Ethos	4.20	4.35	0.38	0.35	0.20	1.73**
Assessment						
Formative Assessment	3.96	4.07	0.42	0.32	0.15	1.49*
Clarity of Assessment	3.96	4.02	0.40	0.37	0.08	1.03
Delivery						
Involvement	3.48	3.53	0.43	0.32	0.07	1.01
Task Orientation	4.02	4.12	0.35	0.26	0.16	1.56*
Personal Relevance	3.41	3.43	0.53	0.50	0.02	0.59
Cooperation	3.83	3.87	0.41	0.35	0.05	0.89
Differentiation	3.48	3.59	0.44	0.48	0.12	1.36*
ASBS Scales						
Attitude to Subject	3.36	3.42	1.13	1.15	0.03	1.61**
Academic Efficacy	3.26	3.23	0.99	0.99	0.02	0.34

*p<0.05, **p<0.01
459 reflection-only teachers (n=508 classes) and 45 focus teachers (n=52 classes)
[a] Average item mean=Scale mean divided by the number of items in that scale.

The results, reported in Table 5.2, indicate that, for all scales, the average item mean for the teachers in the focus group was higher than for the teachers in the reflection-only group. The post-test differences for these two groups of teachers were statistically significant (p<0.05) for six of the 11 COLES scales, namely, Teacher Support, Equity, Young Adult Ethos, Formative Assessment, Task Orientation and

Differentiation. For the ASBS, there was a statistically significant difference ($p<0.01$) for one of the scales, Attitude to Subject. These results indicate that the students in classes taught by teachers who used the feedback as part of a formal action research process perceived a greater change for each of the learning environment, students' attitude and academic self-efficacy scales.

The effect sizes were calculated to examine the magnitudes of the differences in the post-test scores for the reflection-only and focus teachers (as recommended by Thompson, 2001). For the six COLES scales with a statistically significant difference, the effect sizes ranged from between 0.12 standard deviations and 0.20 standard deviations. These results suggest moderately important educational differences between learners' perceptions of the classroom learning environment in classes of the reflection-only teachers and those in the classes of the focus teachers for the post-test. For the Attitude to Subject scale, on the ASBS, the effect size was 0.03 standard deviations for the differences in the post-test scores for students in the classes of reflection-only and those of the focus teachers. Overall, these results suggest that, for the focus teachers, who were involved in a more formal action research process, the post-test changes were greater than for their reflection-only counterparts who used the data for reflection but did not formalise the process.

5.3 USING STUDENT PERCEPTION DATA TO GUIDE IMPROVEMENTS TO THE CLASSROOM LEARNING ENVIRONMENT

The results presented in the previous section suggest that, for teachers wishing to improve the classroom environment, it is worthwhile to not only reflect upon the data but to also engage in a more formal action research approach that involves writing an action plan and reflecting upon each stage of the action research process.

To investigate how the focus teachers used the student feedback (derived from the COLES and the ASBS) to guide their decisions about how they would improve the classroom learning environment and students' attitudes and academic self-efficacy beliefs (Research Question 3), the 45 teachers (12 teachers in 2008, 13 teachers in 2009 and 20 teachers in 2010) drawn from the seven focus schools were monitored more closely than the reflection-only teachers and given opportunities to discuss their

approach and the types of strategies to be trialled. During these interactions, discussions were recorded as field notes. Teachers were also asked to document their action research activities using a reflective journal and to submit a report outlining what they did, the types of strategies implemented and the effect that these strategies had on their classroom and their teaching practices. The focus teachers were also invited to participate at a forum, held at the end of each year, where they were given an opportunity to present their findings, discuss the types of strategies that they employed and to engage in a range of activities to evaluate the processes that they undertook. The recordings of in-depth, semi-structured interviews with focus teachers were transcribed and analysed. My own field notes of classroom observations, emails, telephone conversations and written recordings of discussions and activities during the teacher forums were also analysed.

As outlined in chapter 3, the qualitative data collected was analysed using grounded theory methods, as described by Strauss and Corbin (1990). The written reports, summaries, notes from the reflective journals and interviews with focus teachers were used to develop third person narratives (written from the researcher's perspective) interwoven with direct quotes from the focus teachers.

The three sections that follow report the findings of this qualitative data. Section 5.3.1, Teacher Action Research, includes the narratives of three of the focus teachers to help to illustrate the ways that the focus teachers utilised student feedback to improve their classroom learning environments. Section 5.3.2, Interpretative Discussion, provides a preliminary discussion of the key findings emerging from information gathered from the focus teachers and Section 5.3.3, Teacher Action Research Based on Students' Perceptions as Professional Development, reports the findings gathered from the teacher evaluation group. Further discussion, linking the findings presented here with past research related to teacher action research will be made in the final chapter.

5.3.1 Teacher Action Research

As outlined in Chapter 1 (Section 1.4), the COLES and ASBS were administered to students in the classes nominated by participating teachers. These data were used to

generate a teacher feedback package (for each class surveyed) which contained data for each scale (means, medians, standard deviations) and the mean for individual items. A description of the feedback package and the types of information provided to teachers were described in Chapter 1 and an overview of the process is provided below.

Teachers were provided with information about how to interpret the results for their class either through a workshop, small group or a one-on-one session with myself. In addition, teachers were provided with a guide that provided further information about each scale and how to interpret the data. Teachers were then asked to reflect on their results to help them to identify a particular scale or scales that they would like to focus their improvement efforts. Once decided upon, the teachers then worked either individually or collaboratively to devise strategies that they felt would address the areas which were highlighted by their data.

During the 'acting' phase of the action research cycle, teachers implemented their strategies, monitoring and modifying their activities accordingly. After this six to eight week 'intervention' period, the COLES and ASBS were re-administered to the same group of students. To examine whether the strategies had led to changes in students' perceptions of the learning environment, students' attitudes or academic self-efficacy beliefs, teachers were presented with a set of profiles and data similar to those in the pre-test feedback package. However, the post-test feedback compared responses for both the pre-test and post-test that teachers could use to ascertain the extent of any changes resulting from their intervention.

The ensuing sections use third person narratives and post-test profiles of three focus teachers to illustrate the ways in which the teachers used the pre-test feedback data to guide their improvements to the classroom learning environment.

5.3.1.1 Anne

Anne is a teacher of English with over 30 years of teaching experience. She decided to survey a Year 11 English class of mixed-ability students. After examining her pre-test profile, Anne was concerned about the gaps between the actual and preferred scores for the Differentiation, Involvement and Formative Assessment scales.

With respect to her interpretation of the data she stated:

> My students would prefer a greater level of differentiation and are not engaging with set tasks as much as they would like. There was also a gap in the area of formative assessment. This highlighted for me a number of challenges - How can I manage different tasks and programs in one class? How to motivate and engage students of vastly different abilities and interests? How can I offer a sufficient range of assessment tools and at the same time maintain equity?

Anne felt that the feedback confirmed her own perceptions of what was currently happening in the class. She knew from her own observations and reflections, that there were a number of students who regularly wasted time, were off-task and appeared unmotivated. Anne decided that she wanted to: "Motivate students so that they would take responsibility for their own learning and use their time more productively, to engage with their learning and, as a result, improve their skills".

After discussing the issues with individual students in the class, Anne found that many of them didn't have any real interest in the topics studied in the program that she had designed. Anne had recently participated in a professional learning activity, during which she had taken particular interest in a project that had modelled the use of a differentiated program. Using this idea, Anne decided to ask students about their own interests and abilities and, from there, she devised three programs that aimed to cater for three main learning styles that she had identified through her discussions with her students. She stated that:

> While my teaching strategies for all three programs would be directed towards small group instruction and individual mentoring, learning would be highly individual but would hopefully result in greater group cooperation. The three strategies would

> include: developing a number of different learning programs and allowing students to select from a range of options within each program; basing the programs on student interests after discussing ideas with them; and ensuring that the assessment items for the different programs are equitable.

Anne devised each program with a broad, open curriculum, giving the learner a high degree of control through a choice of texts and topics. Anne presented each of the programs to the students as a class and asked them to select the one that they wanted to do. Students were able to work independently or in groups following their own points of interest with respect to the unifying theme for that particular program. Towards the end of the intervention period, Anne noticed that:

> Within the much broader range of topics and texts, students appeared to be managing their own time within the scope of the overall task. There was also more interaction and sharing of resources and I was able to assist individual students. Student feedback was positive, students were more engaged and the classroom environment seemed more dynamic.

Interestingly, over the intervention period, Anne felt that the strategies she had introduced provided the more capable students with the opportunity to work more independently and, because Anne was able to spend time with students who needed extra assistance, the less able students were more supported in their studies.

When the two instruments were re-administered to students at the end of the intervention period, the results were provided in the form of a profile (see Figure 5.1) which indicated that students' scores for the Differentiation scale had improved considerably and a number of other areas had also improved. Anne noted that:

> The level of response for both the actual and preferred responses shifted outward. I suppose this tells me that students actually liked the ability to choose a learning program which suited their learning style. Students reported that they enjoyed this environment and that they understood themselves as learners more. Lessons were more student-centred and catered for individual interests.

By participating in this process, Anne found that it was possible to have considerable differentiation in one class and, for her, it reinforced the notion that using strategies

to accommodate different styles of learning also increased the levels of student engagement and motivation (as evidenced by the improvements in students' responses to the two scales for the ASBS).

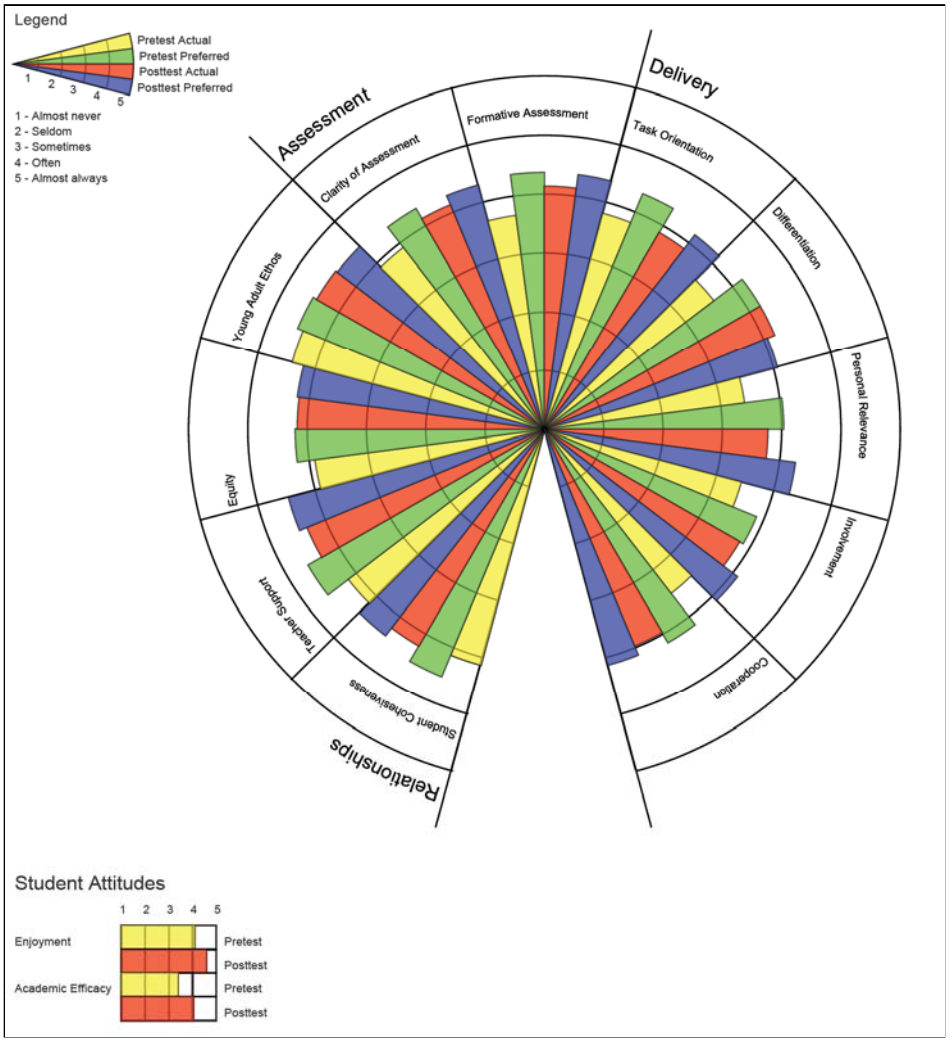


Figure 5.1 Actual and preferred scores for students' perceptions of the learning environment for Anne's class for the post-test

5.3.1.2 Michael

Another focus teacher, Michael (with over 22 years of classroom experience), selected a Grade 11 Photography class with 21 students. Although he considered this class to be cooperative, with what he described as 'nice' kids, he felt that his rapport

with these students differed to other classes and that the students in this class were not generally achieving the results that he expected.

After examining the data, Michael decided to focus on the assessment category as his main area for improvement. It was not the first time that he had considered the role of assessment in student learning having engaged in a similar project in 2006 that had encouraged him to look more closely at what was happening in his own classroom. He remarked that:

> During this project, I became more aware that, when an assessment was returned to the students, many of them only looked at the final mark/grade and that they rarely took the time to read the feedback notes that I was providing. The assessment sheet was placed in their file/folio and the student moved on with the program of work. Sometimes, regardless of intervening discussions, the student would repeat the same or similar errors.

During that time, he had read about the use of digital commentary for student assessment which was part of a research project at the University of Cincinnati (Sipple, 2006) and was keen to implement a similar strategy using the technology available. Michael believed that, by addressing issues with assessment in his class, he might also target issues with Academic Efficacy and Teacher Support that he felt were evident in his data, and which was also reflected in his students' behaviours. In his view, many of the students' were not particularly motivated because they lacked confidence and suffered poor self-esteem.

His key strategy involved changing the way that he delivered his feedback to the students.

> I decided that I should explore strategies that would more positively engage the students in the processes of assessment by providing THEM with better tools and understandings about assessment; providing feedback that was not only complex but personalised, relevant and engaging; providing feedback in a for that catered for all types of learners. I realised that mp3 players, iPods and of course mobile phones, would be the tools of preference for generation "Y".

To do this, he supplemented his usual written feedback with audio comments. The comments were saved as an audio file on the school network and when he handed assignments back (with his written comments); students were able to spend the first part of the lesson listening to his audio feedback. Michael implemented his strategy over a six-week intervention period during which time he provided audio feedback to one major assessment submitted by his students. During this period, he wrote in his journal:

> Last week, four students who had finished their work early (giving me the chance to get the work marked etc.) received their audio files and, at the conclusion of the process, I had one student whip out a note book. I asked her what she was doing and she informed me that she was taking down notes, so that she could incorporate the recommendations in her future work. It doesn't get much better than that for me.

Towards the end of the intervention period he reported that:

> Students often listened to their feedback and made immediate adjustments to current works based on my recommendations. I noticed also that they were more engaged in the processes of assessment.

When the class was re-surveyed at the end of the intervention period, Michael noted that there were positive shifts, not only in the scores for the Formative Assessment and Clarity of Assessment scales (which he had targeted) but also for the Teacher Support scale (see Figure 5.2). While the shift for the Academic Efficacy scale was not as large as he would have liked, Michael felt that there had been a marked improvement in his rapport with his students. There was also an increase in the number of students asking questions related to their work and clarifying what was required for assessment tasks. Importantly, it became evident in subsequent assessments that students made a concerted effort to improve areas of their work that he had highlighted in the audio feedback. Michael also reported that students had responded positively to his new method of feedback and that three students commented that they felt that the feedback was personalised and that the teacher was really trying to help them improve.

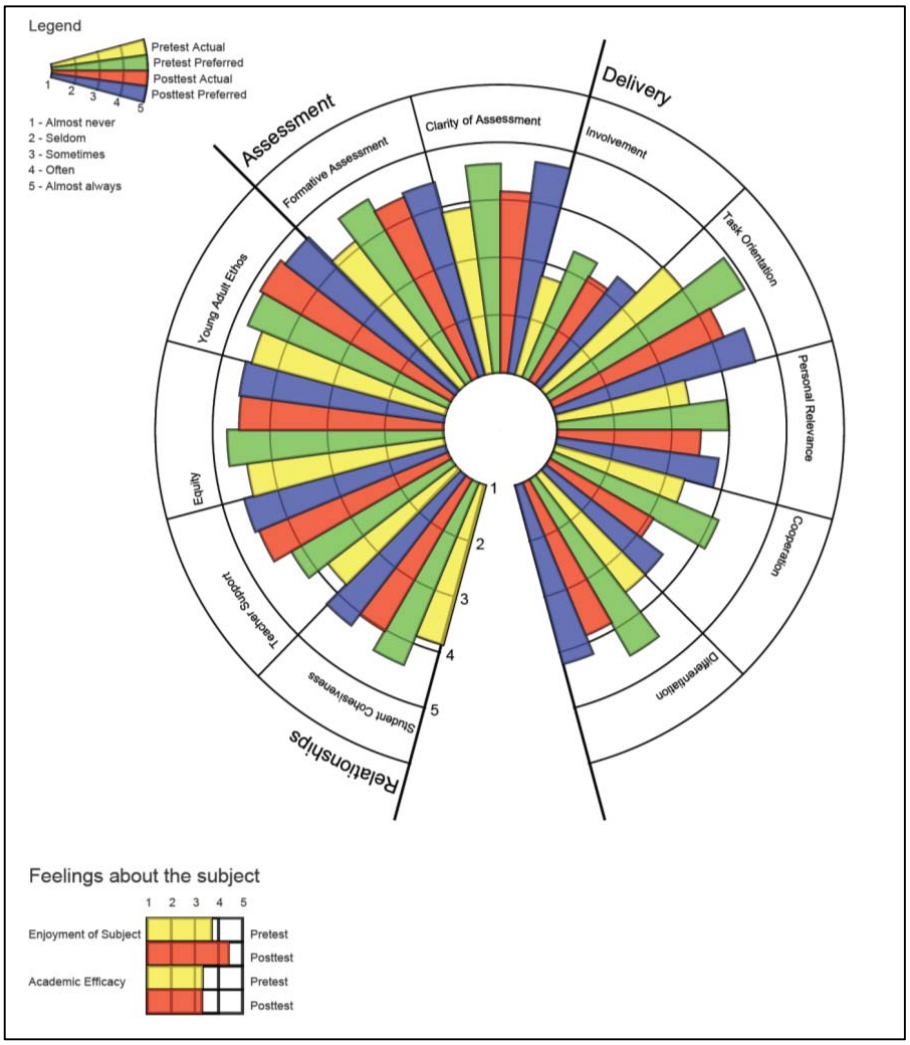


Figure 5.2 Mean actual and preferred scores for students' perceptions of the learning environment for Michael's class for the post-test

5.3.1.3 Peta

Peta, who was in her eighth year of teaching, was persuaded by colleagues who had been involved the year before to join the project. When asked to select a class with whom she would like to work with, Peta chose a Year 11 Human Biology class with eight students.

When Peta examined her profiles, she identified scales with large actual-preferred differences to help her to decide what she would like to work on. For her class, the largest actual-preferred differences were for the Clarity of Assessment Criteria and

the Personal Relevance scales. Peta considered both of these scales to be important and to this end she wrote:

> I think that, in order for students to be engaged, they must feel that their assessments are going to contribute to their learning. In order for [students] to do well in these assessments, my expectations must be clear. I aimed to implement strategies that would address these areas.

Once Peta had decided on the scales that she would focus, she documented the changes that she wanted to make in the classroom and used this document as a guide for implementing different strategies. Peta consulted a wide range of materials gathered from professional development activities that she had attended over the past year. She also reflected on the teaching strategies and the type of assessment that she had used during the year.

> Having done some professional development related teaching strategies I decided to go back to my resources and refresh my memory on the range of strategies which I had been introduced to over the years. I found that I had become comfortable using only a limited range of strategies and that there were numerous effective strategies that could be implemented. It was just a matter of remembering them and finding ways and activities with which to implement them.

Peta decided to show the pre-test profile to the students in her class and to give them the opportunity to discuss the results. Students were encouraged to discuss their expectations (the preferred response) and how they felt that these differed from what was actually happening in the classroom.

It was at this point that the teacher decided to focus on four aspects of the classroom environment rather than two: Clarity of Assessment Criteria, Formative Assessment, Personal Relevance and Differentiation. In describing the initial change that she made in the classroom, Peta stated:

> I decided to modify a couple of assessments so as they became more student directed. This was easy and just a matter of letting the students pick a research topic that they found interesting or was perhaps relevant in their lives at that time. The students had to get my approval before beginning the research so that I could ensure that it was directly related to the course objectives.

To address the issues that she identified as being associated with the Clarity of Assessment Criteria scale, Peta made changes to the way in which she administered assessment tasks in the classroom. The changes included: distributing marking keys with assessment tasks to ensure that students were clear about the expectations; spending more time explaining to students the expectations of the task and its intended outcomes; and encouraging students to submit a draft to minimise the risk of confusion regarding the expectations of the assessment task. With respect to these changes, Peta commented:

> To address the disparity in the Clarity of Assessment Criteria scale, I had to rethink my presentation of each assessment and to improve the communication of my expectations. It concerned me that students weren't aware of my expectations. How were they meant to reach their full potential if they were confused about what the task was asking them to do?

Peta decided to address issues related to the Formative Assessment scale and Personal Relevance scales simultaneously. She highlighted the outcomes that were specifically related to assessment tasks and, for each assessment task, reinforced which outcomes were being addressed.

To help to make the subject more relevant to students, and thus improve the level Personal Relevance, Peta decided that, for selected assessment tasks, she would allow students to pick their own topic (relevant to the subject being studied). Wherever possible, students were actively involved in the assessment tasks. For example, for one task, students were required to examine their energy input and output and determine if they had a healthy diet. Another task required students to design and implement a fitness program that they could use to assess their own fitness.

In addition, Peta tried to encourage classroom discussions that focused on areas where the content immediately related the personal life of the students:

> As a teacher of Human Biology, I knew how relevant the content of the subject was to my students. My challenge was getting the students to see this! When implementing my plan, I tried to include activities that would help the students to identify the personal relevance that my lessons held for them. I hoped that this, in turn, would positively impact on the level of engagement in class tasks and assessments, as well as the quality of work (not only assessment items) that was being presented.

To address issues related to Differentiation, Peta decided to incorporate a range of teaching strategies that would cater for a wider difference in preferred learning styles. Based on student feedback from previous assessments, students were permitted to use PowerPoint instead of a formal report to present their assessment.

The teacher also made use of 'Think, Pair, Share' activities, group work activities and role play. Once a week, she provided opportunities for the whole class to reflect on their week's learning as well to participate in a team activity.

At the end of the intervention period, the class was resurveyed and a post-test feedback package was generated. Peta examined her profiles (Figure 5.3) and noted that the gap between the actual and preferred scores for the Personal Relevance scale was reduced. She felt that that this was most likely because of the modifications that she had made to the assessment tasks in which students were required to use themselves as subjects in two of the assessments and apply knowledge learnt in class to modify and improve their lifestyle.

Overall, Peta felt that the students were more engaged when completing their assessments. To this end, Peta stated:

> The students saw how their knowledge could be applied outside the classroom and seemed eager to do so, such as, how to increase their energy output if their input of certain foods was high or talking to their parents about smoking after a presentation they did on emphysema.

There was also a reduction in the gap between actual and preferred scores for the Clarity of Assessment Criteria scale for the post-test. With respect to the strategy used to reduce the gap between actual and preferred, Peta stated:

> Students submitted drafts of their assessments to make sure that there were no misunderstandings about what the task required them to do. Feedback about this idea from the students was positive and they greatly appreciated having the marking schemes in advance. Their results also indicated that they had a better understanding of what was expected. For Clarity of Assessment Criteria, it was also evident in the post-test results that the strategies were beneficial with a notable increase in actual scores and a decrease in the difference between actual and preferred scores.

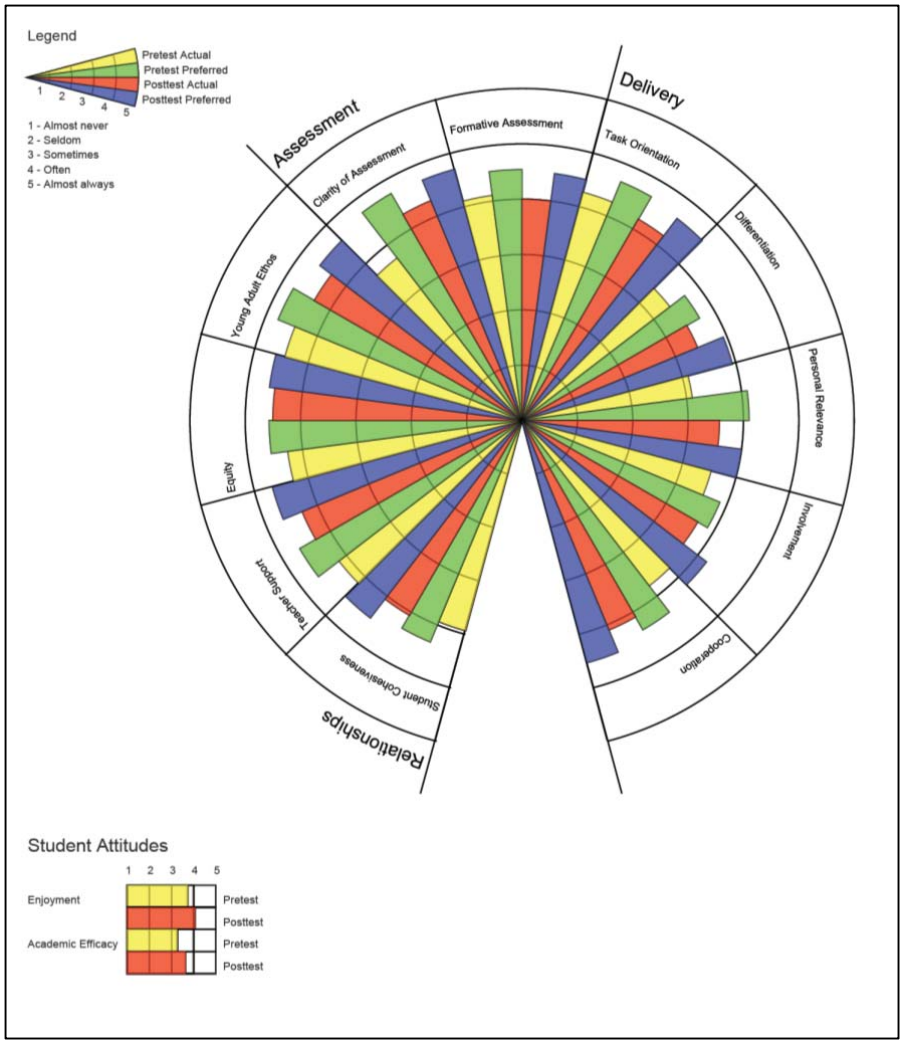


Figure 5.3 Mean actual and preferred scores for students' perceptions of the learning environment for Peta's class for the post-test

The results for the Formative Assessment scale indicated that students perceived slightly less of this dimension for the post-test than for the pre-test. Therefore Peta decided to revise the learning strategies and consider modifying assessments for subsequent classes in the subject to ensure the relevance of the task in terms of their learning outcomes, were made more explicit to students. While student perceptions of the learning environment increased slightly for differentiation, there was also a notable increase in what students would prefer in this area. This perhaps indicated that the changes made by the teacher to cater for individual learning were not only recognised by students but impacted positively on the way in which they learn.

Reflecting on what she learnt from this activity in terms of her own teaching, Peta commented:

> I need to incorporate a broader range of teaching strategies in my lessons and to avoid getting comfortable with only a few. Analysing expectations of assessments is essential, as is delivering the marking key with the assessments. Making Human Biology relevant is easy – I just need to remember to do it. Also I need to give students the opportunity to directly apply their knowledge to their everyday life. Just because I tell students how to do it, doesn't mean that they will, and so they were given the opportunity to do so in assessments.

In terms of student learning, Peta added:

> In my opinion, students are more likely to do well if they can see the relevance in their studies. They need to see the positive contribution that tasks make to their learning. It is also important that expectations are made explicitly clear to students so that they know how to succeed. I already knew that students have a variety of learning preferences; this study encouraged me to revise old strategies and implement these in my classroom. Personal relevance is a powerful tool that can be used to engage students (along with the additional benefits that it holds in their personal lives).

5.3.2 Interpretative Discussion

This section provides a discussion of the common themes, similarities and differences between the experiences and opinions of focus teachers as they carried out their action research. Through a process of constant comparison (Strauss & Corbin, 1990, 1994), data collected and analysed from the focus teachers (n=45) were used to examine similarities and differences with respect to the ways in which teachers used the student feedback (Research Question 3).

The three case studies, presented in the previous section, provide an insight into the activities of the teachers in the focus group. The reflective nature of this study, which encouraged teachers to examine their teaching practices through the eyes of their students, provides teachers with data that they can use as the basis for enquiry that is evidence-based and directly linked to the classroom context. By engaging in action research, teachers were not only encouraged to become reflective practitioners but were also encouraged to use student feedback in a meaningful and constructive way that led to improvements in the way students' perceived the classroom learning environment.

Teacher reflections, during the early stages of the action research process, were focused largely on problem setting. Teachers utilised the pre-test data to help them to decide which aspect of their classroom or their practice would form the core focus of their action research. Although the teacher reflections and the strategies that they implemented were specific to the context of the class from which the data was drawn, to help to make sense of the data, all of the teachers referred to their personal observations, drawing on their professional knowledge and experiences about student learning. Some teachers reflected on their data individually and planned strategies that they were already aware of. As one teacher explained:

> I decided to use a closed-ended (as opposed to open-ended) investigation on electricity to introduce students to the investigation process and to help them to understand and describe physical phenomena. The investigation involved students analysing data in response to a series of carefully worded questions which were scaffolded and sequenced from low order to high order. [Teacher 323, Science].

The teachers used the pre-test data to help them to develop new frames of reference and understandings by considering the viewpoints of their students and colleagues. In some cases, teachers discussed the results with their students to help to explain anomalies, as one teacher described:

> After some reflection and discussion with students in the class, I decided that I needed to structure my questions better in order to: check for understanding; address issues with Equity; increase student involvement and focus on clarifying with students my expectations of them as individuals and as part of the whole class. [Teacher 86, Mathematics]

In trying to make sense of the data, the approaches taken by the teachers often differed. The approach was dependent on the areas targeted for improvement, the level of teacher experience and whether the teacher was working collaboratively with colleagues or alongside their students. One teacher indicated:

> I worked with a colleague in society and environment and two colleagues in science; we discussed our current teaching strategies that were focused on fostering cooperative learning. We decided to video record each other's lessons and to meet later for further discussion about what parts of our selected strategies made the most impact on increasing student centred learning. [Teacher 357, Science]

In the previous section, each of the three focus teachers described how they had shared their results with their students. By doing this, they were able to clarify areas which they were unsure about, gather additional information and negotiate or discuss strategies and ideas. Some of the focus teachers described their attempts to predict how their students would respond to the two instruments and, when examining the data, these teachers commented that, while the data confirmed some of their earlier predictions, there were some surprises. For example, one teacher was surprised to discover that his students did not really understand the role of assessment in his classroom, explaining that:

> The largest gaps were for the two assessment scales. I realised after discussing the results with my students that, while assessments were accepted as part of the course requirement, they didn't consider them to be important. They viewed assessment as an end point, rather than an opportunity for further learning. [Teacher 360, Society and Environment]

In other cases, the data prompted the teachers to gather additional evidence to better inform their understanding of the class and to clarify the issues that they had identified. One teacher stated:

> I collected a fair bit of data from the students. This included evaluations after the first and second term asking the students to give me feedback on the programs of work, one-on-one interviews about their progress, goals and needs; and reflections on the students results, progress and attitudes. This helped me to ascertain the students' expectations and any changes I needed to make. [Teacher 281, English]

With respect to the profiles generated for the feedback package, teachers reported that the packages provided a good overview that enabled them to identify areas for improvement. One teacher commented that: "I found the feedback useful as I could recognise patterns in my classes. They clearly indicated students' perceptions of my teaching style and helped me to identify areas that I consistently need to improve upon (or can pat myself on the back for!)." (Teacher 28, English). Teachers also indicated that they found the item means to also be useful when devising strategies to target the issue that they had identified.

Teachers worked independently or collaboratively both to 'make sense of the data' and to develop strategies. Many teachers reported that they had worked collaboratively with the students to interpret the data and one of these teachers reported working with their students to develop new strategies. One teacher described how they "reflected individually then moved into collaborative mode" (Teacher 357, Science) and another teacher, a recent graduate, described how she worked alongside a colleague to devise and implement appropriate strategies:

> Being a beginning teacher, I was given access to a coach (mentor) in the school. My coach worked directly with me in my classroom. We worked cooperatively in planning and teaching the class, giving me the opportunity to learn and trial different strategies. [Teacher 281, English]

When devising strategies to target areas which teachers had identified for improvement, it was evident that teachers generally referred first to their known repertoire of strategies before deciding to access additional professional development. One focus teacher remarked that, due to time constraints, it was often difficult to access professional development so "generally I identified one area that I wanted to work on and focused on this. I decided to focus on an area that I felt confident that I could improve on without having to access outside help" (Teacher 200, English). Others indicated that their action research gave them an opportunity to trial strategies which they had acquired in the past through professional development (either through an external agency or from within their school). One teacher commented that "[the data] forced me to reflect on my practice and to revisit techniques I had previously used or learnt about" (Teacher 45, Science). Others conducted research in an area of interest or accessed professional development in a particular area or strategy which they planned to trial during the intervention phase. One teacher explained:

> Researching differentiation proved to be a valuable reminder of how learning opportunities can be designed for inclusivity. Areas I found interesting included assessing student interests, modifying/differentiating the curriculum, collaboration and positive interdependence, environmental strategies for developing an inclusive culture, multi-level learning stations and integrated assessment (to name but a few). [Teacher 58, English]

One teacher, after examining the data, identified two aspects of her teaching that she wanted to do differently. To this end she commented:

> Firstly, I needed to make my instructions much clearer for assessment tasks. It was apparent that students were not sure what their assessment tasks should include or what the final product should look like. Secondly, I needed to make my marking keys

> more transparent as the students were not sure how to achieve the highest possible marks. [Teacher 367, Career and Enterprise]

The final stages of the action research process involved teachers implementing their plan of action, monitoring and modifying their plan as they felt appropriate. After this intervention period, to gauge the success of their actions, teachers looked first at their post-test results to identify what had or had not changed as a result of their intervention. In addition to their post-test profiles, teachers also drew on personal observations and other evaluative data, including achievement data, informal evaluations and conversations to assess the impact of their strategies. During interviews, and in their written reports, focus teachers reported that they felt there had been a general improvement in a range of areas, some of which related to student achievement, engagement and attitude. One teacher noted that: "Students expressed many times: 'Oh, now I get how to do this!' It was not only that they suddenly knew the content but they knew what to do with it" (Teacher 28, English). The teacher also reported that in addition to the improvements evident in her post-test data, she felt that there had been other improvements, commenting that:

> On a whole, students were much more cooperative in class and I found that they were much more willing to work with different people in the class. I also observed students seeking advice from their peers before they sought advice from me. [Teacher 28, English]

The overlapping nature of the learning environment scales meant that strategies, used to target one scale often lead to improvements in other scales. For each of the case studies, presented earlier, while teachers had targeted one or two scales for improvement (or four in the case of Peta), there were also improvements in scales that had not been targeted (for example see post-test profiles in Figures 5.1; 5.2 and 5.3). This occurred for all teachers in the focus group.

5.3.3 Teacher Action Research Based on Students' Perceptions as Professional Development

The analysis of information gathered from focus teachers, along with feedback from the teacher evaluation group, indicated that using student feedback (based on students' perceptions of the learning environment, students' attitudes and academic self-efficacy beliefs) was considered, by the teachers to be an effective means of teacher professional development. Teachers felt that it was a valuable activity as it enabled them to take charge of their own professional development needs, through an enquiry form of learning, which was evidence-based and directly linked to their classrooms. 71 of the 78 teachers surveyed in the final year of research (around 90%) agreed that it was a worthwhile model for teacher professional development with many commenting that they felt it provided a means for them to focus on what was important (their students), apply their understandings in their classrooms and, at the same time, help them to improve the quality of their teaching.

Teachers reported that their involvement in this research provided professional learning opportunities which required them to reflect on their own instructional practice, and provided opportunities for experimentation, central to a specific class and group of students. 74 of the 78 teachers (over 94%) indicated that their involvement in the research helped them to reflect on their current teaching practices and 70 of the 78 teachers (90%) agreed that student feedback could be used to guide changes to the classroom learning environment.

Teachers reported that it provided them with opportunities to collaborate with other teachers (and in some cases, their students). While 62 of the 78 teachers (approximately 79%), preferred to work independently, around 32% of teachers indicated that they worked collaboratively with another teacher or a team of teachers within their school. Teachers also reported that their action research activities provided the impetus for the trailing of new or existing strategies to bring about improvement, with 57 of the 78 teachers (approximately 70%) indicating that they implemented strategies that they had used in the past or were already aware of, while 14 of the 78 teachers (approximately 10%) engaged in professional development

provided by an external agency to help them to identify and implement suitable strategies and 11 of the 78 teachers accessed professional development activities within their school context.

The analysis of the data gathered from focus teachers and the teacher evaluation group indicates that student perception data has the potential to provide teachers with a useful and purposeful tool for reflection and professional growth. This, along with the results reported earlier, suggest that, when teachers reflect on student feedback, it is likely that they will make changes to the learning environment that students perceive as more favourable. This replicates past teacher action research which has been successful in stimulating improvements in classroom learning environments (Aldridge, Fraser & Sebela, 2004; Aldridge & Fraser, 2008; Aldridge, Fraser & Ntuli, 2009; Fraser & Fisher, 1986; Sinclair & Fraser, 2002; Thorp, Burden & Fraser, 1994; Yarrow et al., 1997).

5.4 STUDENT PERCEPTION DATA, TEACHER ACTION RESEARCH AND SCHOOL IMPROVEMENT

One of the seven focus schools, the critical instance school linked their involvement in the research program to one component of their multi-faceted school improvement plan which aimed to foster and develop a culture of improvement within the school. This critical instance school worked on the premise that professional development, using teacher action research directly linked to teacher's classroom, would both encourage and provide teachers with opportunities to reflect and to trial strategies consistent with a whole-school approach to teaching and learning.

This section reports the efforts of this school, over the three-year period, in terms of: the school's use of teacher action research as part of initiatives for school improvement (Section 5.4.1); the story of one teacher's efforts to use the student feedback to improve the learning environment (Section 5.4.2); and an examination of the successes of the school-level initiatives (Section 5.4.3).

5.4.1 Using Teacher Action Research as Part of Initiatives for School Improvement

Leadership within the school was considered by the Principal to be a shared process. The school's plan over the three-year period (2008-2010) aimed to address three priorities: 1) to promote shared leadership within the school; 2) support professional learning opportunities for teachers; and 3) to implement a whole-school approach to curriculum development. By 2009, all eleven members of the school's leadership team had completed an 'Instructional Leadership' professional learning program through their local district education office and four aspirant leaders had completed the same course by the end of that year. In addition, four staff members had also achieved accreditation to deliver the program to other members of the leadership team and aspirants in the school.

According to the school's Curriculum Manager:

> I think that what we offer here at the school would satisfy both teacher professional development and professional learning. We show them what constitutes good practice and we try to develop them as a teacher. We model strategies and then we support them back in the classroom.

As teachers engaged in the action research over 2009 and 2010, I held informal and formal conversations with teaching staff, the school's leadership team and students. The teachers whom were interviewed all reported a strong sense of 'community', with most of them regarding the school as a 'learning organisation' where learning is collectively accepted as being the core business for both teachers and students. Those teachers who were interviewed as part of the research program were keen to be involved in the action research with many reporting that they felt that it would give them an opportunity to implement teaching and learning strategies that would address a particular issue. They felt that the student feedback provided meaningful tool for reflection and that the post-test feedback served as be a useful way to examine whether their interventions that they had implemented had made a difference to the way that their students' perceived the classroom learning environment.

Discussions with students during the administration of the surveys indicated that many felt that their teacher's involvement in the action research showed that their teacher valued their opinions. In comparison to other schools, students were generally willing to participate in the surveys and to give feedback which they knew would be used by the teacher, as a means for reflection and improvement. The teachers at the school also reported that they believed their involvement in the action research helped to reinforce in their students the importance of continuous learning.

The school's involvement in the research was seen to fulfil a number of aims of the school's improvement plan. First, it gave teachers an opportunity to access professional development which occurred as part of an action research process, within their immediate school context, with a focus on a particular class group which they nominated. Secondly, it linked with other school initiatives related to curriculum development. In 2006 and 2007, a small number of teachers had been encouraged to pilot the use of 'cooperative learning' strategies with their students. In the context of this school, cooperative learning relates to an instructional strategy that involves students working in small groups or teams to help one another to learn academic material (Slavin, 1991). Based on the success of this activity, the school decided to embarked on a program which involved training one to two teachers from each learning area whose role in the school would be to support teachers' trialling of cooperative learning strategies and to encourage others to consider the benefits that these strategies could have on teaching and learning in their classrooms. By the end of 2009, there were four teachers who had accessed specific training in the area of cooperative learning and 'instructional intelligence' (Bennett & Rolheiser, 2001) through the local district education office. These teachers were then able to deliver the accredited program to other teachers. The curriculum manager indicated that both the school's leadership team and members of the Curriculum Development Committee held the view that the competencies, linked to these training programs, increased the number of strategies in a teacher's repertoire that could be called upon, when required, to facilitate students learning on a given task.

In 2008, the school embarked on a five-phase school-based implementation strategy known as the IDEAS process (Crowther, 1999). A part of this process involved the

administration of a survey to examine the school culture and teaching practices. The IDEAS process focuses on the action of teachers in the classrooms rather than change in organisational structures and is underpinned by the concepts of professional community and shared leadership (Crowther et al., 2002; Marks & Louis, 1999). The data gathered from this survey indicated the existence of a strong culture of learning among the teachers at the school. Buoyed by the results in the survey, by the end of 2009, the school had successfully established its school-wide pedagogical principles and vision. It was envisaged that that these teaching and learning principles would be embedded across the school in all curricula and would inform the types of instructional practices carried out by their teachers. Aside from teacher involvement in action research as part of this research program, teachers also accessed other professional learning opportunities both within the school and through external providers. This included several IDEAS workshops; cooperative learning strategies and instructional intelligence training workshops; and conferences specific to individual learning areas. The teacher action research activities undertaken as part of this research program provided opportunities for teachers to put into practice those teaching and learning strategies that they had been exposed to as part of the whole-school focus on curriculum development.

With respect to the teachers' involvement in this research program, which involved them using student feedback as a basis for reflection and action research, one member of the leadership team remarked:

> In terms of the action research activity, it helped us to focus teachers. When teachers got their data and selected an area for improvement, we sent them information and ideas related to things that they could trial... At the end of the day, however, it was up to the teacher to decide whether or not they wanted to use some of these strategies or trial their own.

Using student feedback as the basis for teacher action research also provided teachers with opportunities to share and participate in collegial discussions, which focused on

what they do in the classroom and ways to improve their teaching practices. The Curriculum Manager noted that:

> Because of all of this cohesiveness [in terms of staff interactions], the support that we have and networks we have established at the college, teachers feel that they are not pressured into doing something but that the support is there if they want to trial it.

Interviews with focus teachers at the school indicated that the level of support provided by the school and the number of teachers who openly talked about what they did in the classroom, was quite influential. One teacher remarked that: "Teachers don't feel like they have to do it but, because they see other teachers doing it, they feel like, 'Well, I don't want to miss the boat', so they try a few things too" (Teacher 86, Mathematics). This notion of action research affecting the professional practices of other teachers reflects the findings asserted by Reeves (2008) who found that teachers who engaged in classroom research often influenced the performance of other teachers and school leaders. To monitor initiatives linked to the third school priority which focused on developing a whole school approach to curriculum development, a survey of students undertaken by the school in 2010 reported that a range of cooperative learning strategies were being used by teachers, including mind/concept maps, think pair share, place mats and that students were both aware of the strategies and their purpose in terms of facilitating their learning.

According to the Principal and Curriculum Manager, the whole-school data collected using the two instruments for each year allowed the leadership team to reflect on whole-school priorities, particularly those which related to shared leadership and pedagogy. This data provided a good basis for discussion regarding the school's performance in these areas and the school's direction in terms of future planning. The way the school used this data is discussed in more detail in Section 5.4.3.2.

The extent to which this school was able to demonstrate levels of continuous improvement over the three-year period may be seen, in part, as a result of the school's organisational culture. A number of factors that Reezigt and Creemers (2005) describe as an 'improvement culture' were clearly evident at this school. The school had a high staff retention rate; sustained a highly motivated and committed

work force who had a clear understanding of the school's direction and vision; and, who as a part of the whole-school community, actively work towards the achievement of this vision. The commitment of the school to teacher professional development, as evidenced by their involvement in this research program over the three-year period, in addition to other initiatives, demonstrated the capacity of the school to become a 'learning organisation' (Reezigt & Creemers, 2005) and to support their teachers to become reflective practitioners.

5.4.2 Maggie's Story

This section describes the activities and processes undertaken by one of eight focus teachers from the critical instance school. Maggie was a mathematics teacher who had been teaching for four years, three of which involved teaching students at the senior secondary level. Maggie participated in the research over two years and used her involvement to gauge her performance and to help her to improve her teaching practice. This section reports how Maggie used her data during one of the two years.

Maggie decided to focus her improvement strategies on a Grade 12 senior mathematics class comprised of 15 students, a majority of whom were boys aspiring to attend university in the field of science and mathematics. After the class was surveyed, Maggie examined her data and considered some of the challenges and issues that she had with the class. She identified two areas for focus, Equity and Involvement.

Maggie considered her data and discussed the results with students in her class. After further discussion with a colleague in her learning area, Maggie felt that many of the issues related to the two scales that she selected, Equity and Involvement, were similar and decided to use a range of strategies to increase student involvement in class activities.

> In terms of Equity, I thought carefully about what was happening in the classroom and realised that there were students who sat at the rear of the class who were quiet and students who sat at the front of the room who were enthusiastic. I also realised that I tended to engage with the students at the front as they were more likely to ask questions of me. While I assumed that the students at the back were doing okay, I

> really did not know if they were paying attention or understood the work. With respect to Involvement, I decided to employ a number of strategies that were related to Instructional Intelligence and Cooperative Learning that I had become aware of through the professional learning activities offered through my school.

To help her plan for her intervention, Maggie accessed the designated support person in her learning area for advice on the types of cooperative learning strategies that would best address the issues that she had identified. Maggie also formed a partnership with a more experienced teacher of mathematics to share ideas and to discuss her results.

During the six-week intervention period, Maggie trialled a number of strategies designed to increase student involvement, including, mind maps, ghost walks and place mat activities (all of which Maggie had become aware of during Cooperative Learning workshops held at the school). These activities were designed to create a safe environment in which quieter students would be more willing to take risks with their learning. Maggie hoped that the use of small groups would help to build learning partnerships between students and facilitate their understanding of important concepts and ideas. To promote further inclusivity, when addressing the whole class, Maggie focused on improving her questioning techniques by structuring and framing her questions in ways that targeted specific students to keep them on task and to check their understanding. To this end she commented:

> In addition to improving my questioning techniques to check for understanding, I started to move around the classroom instead of standing at the front of the room. As I moved around the room, I addressed students individually and directed my questions so that all students, including those I considered to be quiet, were involved in the lesson.

At the end of the intervention period, the two instruments were re-administered to her Grade 12 class. Figure 5.4 provides a feedback profile that shows the result for her pre-test data and her post-test data. This profile indicates a pre–post improvement for the Equity and Involvement scales, the two areas that Maggie had targeted. Aside from the data presented to her, Maggie felt that there was a noticeable improvement in the classroom learning environment which was supported by a number of informal

discussions that she had held with her students. Maggie felt that the class was a more active, cohesive group and this was supported by her data which also showed corresponding shifts in the areas of Student Cohesiveness and Teacher Support.

As a beginning teacher, Maggie was keen to access the range of professional development activities provided through her school. In her interviews, Maggie explained how the school had encouraged her to consider the ways she could integrate cooperative learning and other targeted instructional strategies to target the areas which she had identified in her data. Maggie also described how she drew on a range of professional readings and other materials provided through the cooperative learning workshops to design her intervention strategy. Throughout the process, Maggie regularly accessed her learning area support person for advice and to bounce ideas off. Maggie also engaged with other colleagues to discuss the successes and challenges presented to her during the intervention phase. Towards the end of the process, Maggie was already considering accessing other opportunities offered through her school designed to foster reflective practice. This would involve working alongside a colleague, whereby each would record the other during a lesson and then meet afterwards to identify areas and strategies for further improvement.

When reflecting on her experience during the research program, Maggie acknowledged the role the school played in supporting her professional growth. Maggie commented:

> In terms of my teaching practice, I have been able to put into practice a number of strategies that I have picked up from professional learning activities undertaken through the school, conversations with colleagues and what I already knew. In particular, I have increased the type and effectiveness of teaching and learning strategies that I use in the classroom. I feel that my questioning techniques are now more effective and, as a result of my efforts with this class, I know how to check for understanding and know how to implement a range of strategies to get students more actively involved in their learning which I hope means that their understanding of the work has also improved.

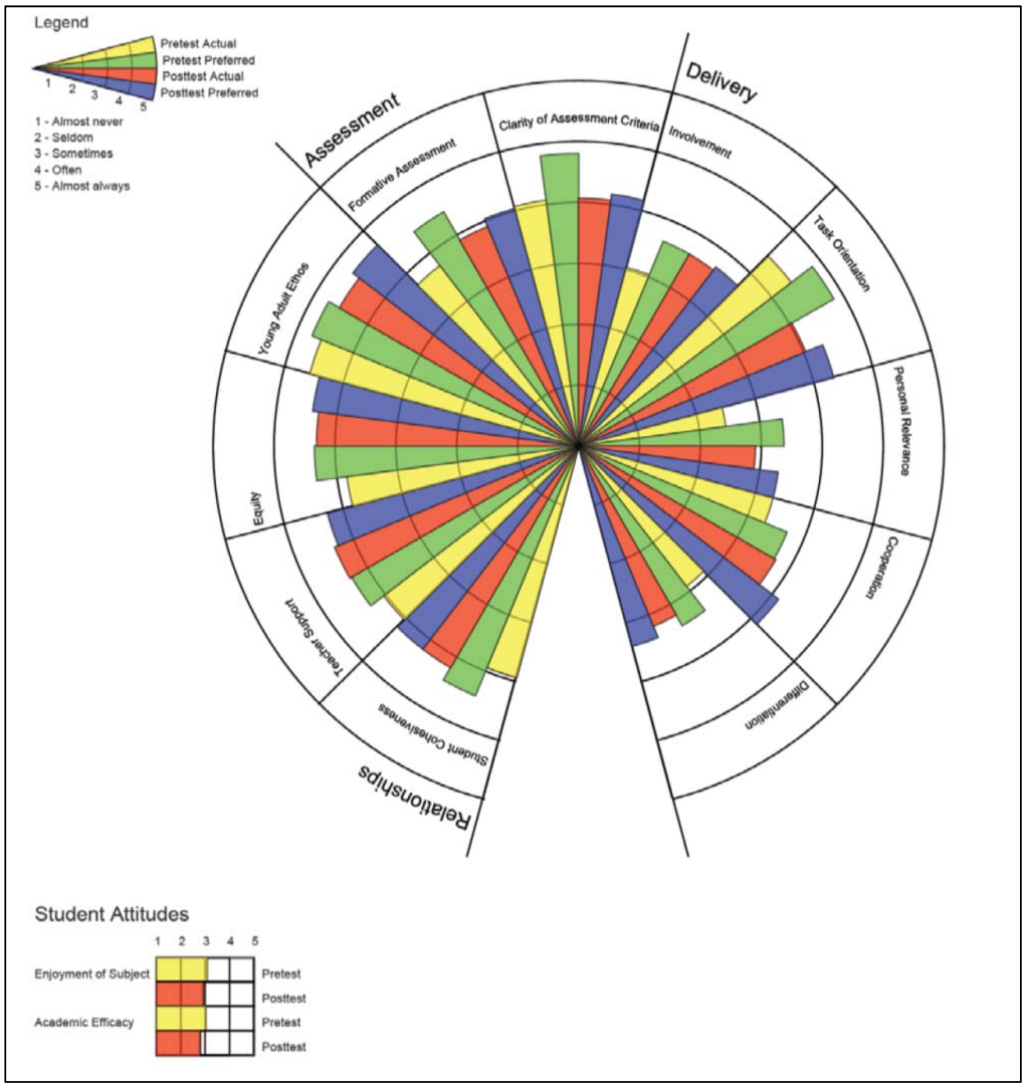


Figure 5.4 Mean actual and preferred scores for students' perceptions of the learning environment for Maggie's class for the post-test

The critical instance school purposefully linked their teacher's action research to their initiatives for school improvement. These initiatives sought to promote shared leadership, provide professional development opportunities for their teachers and support a whole-school approach to curriculum development focused on the use of cooperative learning strategies and the application of a teacher's instructional intelligence to bring about improvements in the learning environment and enhance student outcomes.

Maggie's story is an example of how one teacher at the critical instance school used teacher action research to put into practice a range of strategies that were consistent with this whole-school approach to teaching and learning. The selection of cooperative learning strategies for the intervention was also reflected in the interviews, written reports and reflective journals of the other seven focus teachers at this school. Collectively, the focus teachers acknowledged that their teacher action research activities which involved them conducting enquiry-based research in their very own classrooms linked to the school initiative related to shared leadership. Importantly, Maggie and the other focus teachers felt that this and other school initiatives helped to address the professional needs of teachers by providing access to a range of professional development activities to explicitly support their core business, teaching.

5.4.3 Monitoring the Success of School-level Initiatives

As described in the last section, the use of teacher action research using student feedback, at the critical instance school, formed part of a whole-school approach designed to improve teaching and learning practices in the school. It also provided a range of data which was used to assess and monitor the level of school improvement according to achievement targets linked to the three school priorities in the school's plan. School profiles showing the average item mean for each scale for each of the three years were generated using all students' responses to the two instruments. At the administrative level, these profiles provided a simple overview of the school's progress in terms of students' perceptions of the learning environment, their attitudes and academic self-efficacy beliefs. Such profiles were found to be highly useful for generating discussions amongst teachers and administrative staff, as well as for assisting with decisions about the professional development needs of teachers. In addition, the profiles were used to provide information that could be used as part of the school's end-of-year reporting and accountability. The next section reports the results of the analysis of the data collected over the three-year period in terms of: changes to the learning environment (Section 5.4.3.1); and school-level changes (Section 5.4.3.2).

5.4.3.1 Changes to the Learning Environment

Table 5.3 provides the average item mean and average item standard deviation for the COLES and ASBS scales for each of the three years (2008–2010). Although it was heartening for teachers and administrative staff to know that there was a general increase in scores for nine out of the 11 scales for the COLES over the three years and one scale for the ASBS, the data does not indicate whether or not the between-year changes were statistically significant. To do this, MANOVA was used, the results of which are reported in Table 5.3.

Table 5.3 Average item mean, average item standard deviation and MANOVA results for differences between 2008, 2009 and 2010 in the COLES and the ASBS using the class mean as the unit of analysis

Scale	Average Item Mean			Average Item Standard Deviation			Difference between Years
	2008	2009	2010	2008	2009	2010	*F*
COLES Scales							
Relationships							
Student Cohesiveness	4.19	4.07	4.05	0.26	0.26	0.29	3.17**
Teacher Support	3.67	3.90	3.95	0.65	0.43	0.45	3.37*
Equity	3.99	4.13	4.26	0.57	0.38	0.34	3.60*
Young Adult Ethos	4.17	4.28	4.28	0.49	0.36	0.23	1.02
Assessment							
Formative Assessment	3.95	3.95	3.90	0.42	0.37	0.29	0.31
Clarity of Assessment	3.88	3.88	4.01	0.39	0.30	0.27	2.40
Delivery							
Involvement	3.21	3.26	3.27	0.42	0.37	0.40	0.28
Task Orientation	3.99	4.05	4.06	0.31	0.29	0.25	0.63
Personal Relevance	2.98	3.12	3.36	0.59	0.45	0.44	6.08**
Cooperation	3.59	3.78	3.81	0.35	0.34	0.44	4.11**
Differentiation	3.32	3.40	3.43	0.41	0.31	0.30	1.12
ASBS Scales							
Attitude to Subject	3.25	3.28	3.44	1.12	1.13	1.05	2.05
Academic Efficacy	3.14	3.14	3.31	1.01	1.05	0.98	10.31**

*$p<0.05$, **$p<0.01$
N=18 classes in 2008, 25 classes in 2009, 21 classes in 2010
Effect size was calculated using formula of $d= M_1-M_2/\sqrt{[(\sigma_1^2+\sigma_2^2)/2]}$

The results indicate that there were statistically significant differences in students' perceptions of classroom environment ($p<0.01$) over the three years for five of the 11 learning environment scales for the COLES, namely, Student Cohesiveness, Teacher

Support, Equity, Personal Relevance and Cooperation. Further, for the ASBS, there was a statistically significant difference for students' Academic Efficacy ($p<0.01$) for but not for students' Attitude to Subject. The average item mean (reported in Table 5.3) for each scale shows that, over the three years of the study there an improvement in students' scores for all of the scales with a statistical significance.

To interpret the statistically significant between-year difference in scale scores identified through the ANOVAs reported in Table 5.4, Tukey's HSD multiple comparison procedure was carried out to ascertain the statistical significance of differences between two pairs of years (i.e. 2008 and 2009, 2009 and 2010), as well as the overall difference for the three-year period from 2008 to 2010, for each scale. The asterisks in Table 5.4 indicate which scales, using Tukey's HSD procedure, for the pairwise comparisons of years, were statistically significant.

Table 5.4 Effect size and Tukey's HSD multiple comparison for statistical significance of difference between each pair of years for the COLES and the ASBS

Scale	Effect Size & Tukey HSD		
	2008-2009	2009-2010	2008-2010
COLES Scales			
Relationships			
Student Cohesiveness	-0.22*	-0.04	-0.25*
Teacher Support	0.20*	0.06	0.24*
Equity	0.14	0.18	0.28*
Young Adult Ethos	0.13	0.00	0.14
Assessment			
Formative Assessment	0.00	-0.07	-0.07
Clarity of Assessment	0.00	0.22	0.19
Delivery			
Involvement	0.06	0.01	0.07
Task Orientation	0.10	0.02	0.12
Personal Relevance	0.13	0.26*	0.34*
Cooperation	0.27*	0.04	0.27*
Differentiation	0.11	0.05	0.15
ASBS Scales			
Attitude to Subject	0.01	0.09	0.07
Academic Efficacy	0.05	0.21**	0.15**

*$p<0.05$, **$p<0.01$
N=18 classes in 2008, 25 classes in 2009, 21 classes in 2010
Effect size was calculated using formula of $d= M_1-M_2/\sqrt{[(\sigma_1^2+\sigma_2^2)/2]}$

Additionally, the effect sizes (calculated by dividing the difference in average item means for a pair of years for each scale by the pooled standard deviation for that scale for those years) each pair of years is reported in Table 5.4 for each scale for the COLES and ASBS. These effect sizes provide a measure of the magnitude, or educational importance, of differences in scale scores between years (Thompson, 2001).

An overall interpretation of differences in students' perceptions from 2008 to 2010 can be made by examining the average item means (reported in Table 5.3), the effect sizes (reported in Table 5.4), and the results of the statistical tests involving Tukey's multiple comparison procedure (reported in Table 5.4).

Pairwise post hoc comparisons, reported in Table 5.4, reveal the statistically significant changes ($p<0.05$) between pairs of years, together with the effect sizes associated with those significant changes, as discussed below.

Changes between 2008 and 2009

Between 2008 and 2009, there was a statistically significant improvement in scores for the two learning environment scales of Teacher Support (effect size = 0.20 standard deviations) and Cooperation (effect size = 0.27 standard deviations). Interestingly, the Student Cohesiveness scale (effect size = -0.22 standard deviations) which also can be considered moderate according to Cohen's criteria declined between the 2008 and 2009.

Changes between 2009 and 2010

Between 2009 and 2010, there was a statistically significant improvement for the Personal Relevance scale (effect size = 0.26 standard deviations) and Academic Efficacy scale (effect size = 0.21 standard deviation). In both cases, the magnitude of the differences, according to Cohen's criteria, can be considered moderate.

Overall changes between 2008 and 2010

Over the three years of the study, there was an improvement in students' perceptions for four of the 11 learning environment dimensions: Teacher Support (effect size = 0.24 standard deviations); Equity (effect size = 0.28 standard deviations); Personal Relevance (effect size = 0.34 standard deviations); and Cooperation (effect size = 0.27 standard deviations). According to Cohen (1992), these effect sizes indicate 'moderate' changes for these for scales between 2008 and 2010. Notably, the effect size for Student Cohesiveness was -0.25 standard deviations, indicating a 'moderate' decline for this scale. In terms of the scales for the ASBS, over the three years of the study to 2008 and 2010, there was an improvement in academic self-efficacy beliefs (effect size = 0.15 standard deviations). According to Cohen (1992), this effect size is considered "small".

The results indicate that there was a moderate, positive change (Cohen, 1992) over the three-year period for four of the eleven scales, these being; Teacher Support, Equity, Personal Relevance and Involvement. The school identified two of these scales as being important indicators of classroom improvement in relation to curriculum development initiatives being implemented at the school during that period. These two scales and their improvement over the three years are discussed in the next section.

5.4.3.2 School-Level Changes

At the end of each year, whole-school data was provided to the school Principal who then shared it with other members of the leadership team. Interviews with the leadership team indicated that it was useful in useful in terms of both furnishing feedback with respect to the efforts of the teachers and for identifying future professional development needs. In addition, interviews with members of the leadership team also suggested that the data was used to gauge the success of their school improvement efforts as outlined in their school plan and to assist in their planning for future school improvement initiatives.

Improvements in students' perceptions of Teacher Support, Equity and Personal Relevance over the three-year period indicated to the school leadership team that the teachers were putting in place strategies that engaged and supported student learning. During interviews, three of the eight focus teachers identified the Teacher Support and Equity scales to be important to them and their efforts when planning their modifications to the classroom learning environment. To this end, one of these teacher's remarked that it was foremost in their mind to "create a safe environment, in which students were willing to take risks in their learning and to become more independent" and "I used a range of cooperative learning strategies, like 'think, pair, share' and 'placemat' to allow students to gain confidence and become more active participants in the classroom" (Teacher 280, Mathematics). The members of the school leadership team, who were interviewed, generally felt that the improvement of these scales indicated that the school-level professional learning for teachers (which encouraged teachers to employ their instructional intelligence to select the most appropriate teaching and learning strategies) were being translated into classroom practice.

Members of the leadership team generally agreed that the improvements in the Cooperation scale was evidence of efforts to get teachers to consider the way they operate in the classroom through school-level professional development activities that encouraged teachers to utilise cooperative learning strategies and consider their classroom delivery as being integral to student learning. These professional learning activities encouraged teachers to employ their instructional intelligence to select the most appropriate strategies (including cooperative learning activities) to maximise learning opportunities and student understanding of a particular concept or idea. One focus teacher indicated that their participation in school-level activities related to instructional intelligence and cooperative learning has "made me a lot more aware of what I want to try and do in the classroom" and "During the intervention period, I began framing and directing my questions more carefully in the classroom and used 'wait time' in a more conscious fashion" (Teacher 86, Mathematics).

The results and findings from the qualitative data suggest that student feedback may also provide useful data with which the school can use to gauge the success of their

school improvement efforts as outlined in their school plan and assist in their planning for future school improvement. This was shown by the ways the data was used by this school to identify areas for further investigation and consideration.

The student perception data collected for the whole school over the three-year period was used to identify areas for further discussion and to assist in their planning for future school improvement activities. At the end of the three-year period, the school leadership team decided to use the data as part of a reflection activity involving all teachers at one of their school development days. Teachers were presented with the whole-school data and were provided with opportunities for discussion. During an earlier examination of the data by the school leadership team, discussions had centred on the results for the Student Cohesiveness scale and the two assessment scales, Clarity of Assessment Criteria and Formative Assessment. As part of the reflection activity, teachers were asked to try and account for the results for these scales over the three-year period.

Teachers reportedly were initially puzzled as to why the Student Cohesiveness scale had declined and decided to examine more closely the items in the scale. After much discussion, there emerged two trains of thought to account for the anomaly. The first related to the wording of the items which school members felt emphasised the idea of 'friendships'. It was felt that students at the school approached their classroom with a work-oriented attitude and found it difficult to associate their perceived work relationships with personal friendships which were more evident outside of this environment. The second train of thought felt that perhaps the data indicated that students did not feel that the work environment was 'friendly' and suggested that it was important for teachers to consider the way the environment was perceived. This group of teachers felt strongly that, while it was important to foster classroom environments which were productive and focused on learning, it was just as important to ensure that this included fostering productive and positive work relationships between students. Many felt that cooperative learning strategies could be used more strategically to achieve this.

This reflection activity helped to identify a number of issues related to Student Cohesiveness and the two Assessment scales, and small groups of teachers worked to generate possible strategies to target the issues which had been identified. The school leadership team used these ideas to help to guide their future planning. As a result of these efforts, the school leadership team decided to focus future teacher development initiatives around the use of cooperative learning strategies to enhance student cohesiveness in the classroom and on improving teacher understandings of formative assessment and the ways formative assessment practices could be incorporated into the senior secondary learning context.

The analysis of the written reports and interviews with focus teachers from this school suggests that, when implemented as part of a school initiative, teacher action research, using student feedback, may be an effective vehicle with which teachers can improve their classroom learning environments in a range of areas targeted by the school. On an individual teacher level, this approach provides opportunities for teachers to draw on assistance from colleagues, leaders in the school and other support structures put in place by the school. Importantly, teachers are able to access professional development within their school context, focused on specific students and classrooms rather than access more traditional forms of professional development which generally occur outside of the immediate school context.

The findings also indicate that a whole-school approach to teacher professional development which openly targets and actively supports teachers to improve the quality of their teaching contributes to building and maintaining a school culture that values continuous learning and one which encourages teachers to put into practice teaching and learning strategies consistent with the school's vision.

5.5 CHAPTER SUMMARY

This chapter described how student feedback, based on students' responses to the COLES and the ASBS, was used by teachers and schools to improve the learning environment. To investigate whether teachers' reflection and action on the data generated using the COLES and the ASBS led to improvements in students' perceptions and address Research Question 2, the pre–post sample, which involved

459 of the 548 teachers involved in the research program (and comprised of 6107 student responses), were analysed using multivariate analysis of variance (MANOVA). The results show that there were statistically significant changes for eight of the 11 scales for the COLES and for both scales of the ASBS. In addition, the effect sizes for these scales suggested moderately important differences between students' perceptions before and after teachers implemented their planned interventions. This data suggests that when teachers' reflect on student feedback (based on students' perceptions of the learning environment, their attitudes and academic self-beliefs), they are likely to implement changes which students perceive more favourably.

Further analysis of this pre–post sample was undertaken to examine whether differences existed between the 414 teachers who used the student feedback for reflection-only and the 45 focus teachers who used it as part of a formalised action research process. As there were no statistically significant differences for the two groups for the pre-test, it was considered acceptable to examine differences for the post-test data only. The results indicated that, for six of the 11 COLES scales and for one of the ASBS scales, the post-test results were statistically significantly ($p<0.05$) higher for teachers in the focus group than for teachers in the reflection-only group. These results suggest that although reflecting on student feedback can bring about changes to the learning environment which students perceive to be more favourable, to bring about greater levels of change, it is worthwhile for teachers to reflect on student feedback using a more formal action research process.

Qualitative data gathered from the 45 focus teachers (12 teachers in 2008, 13 teachers in 2009 and 20 teachers in 2010) were analysed, using grounded theory methods (Strauss & Corbin, 1990), to investigate how teachers used feedback from their students to guide their improvements to the classroom learning environment and implement strategies which target issues related to students' attitudes and academic self-efficacy beliefs (Research Question 3). The findings suggest that student feedback generated from the COLES and the ASBS can be a valuable tool for teacher reflection and classroom change.

A closer examination of the ways teachers approached their data highlighted a number of features that were common to all teachers in the focus group, the most important of which was that the data was interpreted in a way which was meaningful to the context of a specific group of students. While all teachers commenced by drawing on their existing professional knowledge and understandings about teaching and learning, there were instances where teachers consulted with their colleagues or discussed their results with their students. Teachers considered this as being important as it helped clarify their thinking before deciding on the best course of action for implementation. Importantly, at all phases of the action research process, teachers were observed engaging in reflective practices which were purposeful and deliberate. The student feedback provided teachers with different perspectives about their teaching and by reflecting on this data as part of an action research process, teachers were able to form new understandings about their teaching, their students and the way students learn. This process of reflection and action which was facilitated by student feedback data was seen by teachers to be instrumental in bringing about change in students' perceptions about their respective classroom learning environments.

Data collected from the focus teachers, forum activities and the teacher evaluation group were also used to address Research Question 4 which examined whether using student feedback in this way was considered by teachers to be a worthwhile professional development activity. The findings suggest that teacher action research based on student perception data was considered by teachers to be an effective and time-efficient professional development activity which contributed to their professional growth. Teachers reported that it was worthwhile because: it involved teachers taking charge of their own professional development needs through an enquiry form of learning which was evidence-based and directly linked to their classrooms and students; the student feedback provided a useful tool for reflection and the impetus for the trailing of new or existing strategies to bring about improvement; it provided opportunities for collaboration with other teachers and in some cases, students; and importantly, teachers felt that as a result of their involvement, there were improvements in the quality of their teaching and student affective and cognitive outcomes.

A range of qualitative and quantitative information was gathered from one of seven focus schools, the critical instance school, to investigate the ways the school utilised student feedback as part of a teacher professional development activity which was linked specifically to their initiatives for school improvement (Research Question 5). Over the period of research, 729 student pre–post responses (192 responses in 2008, 290 responses in 2009 and 247 responses in 2010) to the COLES and the ASBS from 64 classes (18 classes in 2008, 25 classes in 2009 and 21 classes in 2010) were collected through the action research activities of 35 teachers (nine of whom participated more than once over the three-year period). The findings show that for the critical school, there were general increases in students' responses for nine out of the 11 scales for the COLES and for both scales for the ASBS. In addition to this, there were statistically significant differences in students' perceptions for five of the 11 scales for the COLES and for one scale for the ASBS. These findings suggest that efforts at the school-level, which involved linking the action research activities of their teachers to their school improvement strategy which targeted teacher professional development, led to improvements in students' perceptions of the learning environment, students' attitudes and academic self-efficacy beliefs.

In addition to this, a range of information (as discussed earlier) was gathered from eight teachers (three teachers in 2009 and five teachers in 2010) who were part of the focus group. Interviews conducted with members of the school leadership team and a range of school documents, including annual reports, yearly operational plans and other documents detailing the school's improvement initiatives were also analysed. The findings show that the school was able to utilise school-level data as a tool to assess and monitor school improvement goals as outlined in their school planning documents and satisfy external reporting requirements. The school-level data was as the basis for discussion and reflection by the school leadership team and shared with teachers. The process of reflection and discussion utilised by the school leadership team with teachers was helpful to future school planning and support the development of shared leadership within the school. Further to this, information collected from focus teachers indicated that the strategies and activities implemented were consistent with the whole-school approach to curriculum development. These findings also suggest that a whole-school approach to teacher development, as

demonstrated by the critical instance school, may be an effective way to address school initiatives aimed at improving teacher quality and enhancing student outcomes.

CHAPTER 6

DISCUSSION

6.1 INTRODUCTION

This thesis reported the results of a large-scale research program that involved the use of a multi-method design and comprised of two concurrent and interrelated investigations. The first (Part A) investigated the development and validation of two instruments, one to assess students' perceptions of the learning environment and another to assess their attitudes and academic self-efficacy beliefs. The second (Part B) investigated the ways in which teachers used student feedback (collected using the two instruments) to reflect, plan and implement strategies for improvement and whether this approach was a worthwhile model for teacher professional development.

To address research questions related to Part A of the investigation, quantitative data were collected from a sample of 10,345 secondary students over three years in 684 classes. These data were analysed to examine the reliability and validity of the newly-developed COLES and the ASBS. Over the three-year period, 459 of the 548 teachers who participated in the research (some of whom selected more than one class) were involved in a pre–post component which involved using the data to guide their action research activities. The pre–post sample (n= 6107 student responses) was used to investigate whether teachers' reflection and action on the feedback (generated using these two instruments) led to improvements in students' perceptions of their learning environments, their attitudes and academic self-efficacy beliefs.

To answer research questions related to Part B of the investigation, 45 of the 459 teachers, known as focus teachers, were involved in the pre–post component and used a formal action research approach. The data collected from these teachers, in the form of entries in reflective journals, written reports, discussions and participation at a forum, were analysed to investigate the ways in which these teachers utilised the student feedback as part of the action research process. This, along with other teacher

evaluation information was used to assess the value of such an approach to teacher professional development.

The thesis also reported the efforts of one of seven focus schools, the critical instance school, which purposefully targeted teacher professional development as part of an initiative for whole-school improvement. Data collected from this school was analysed to investigate the ways the school utilised student perception data gathered as part of this research program to guide their planning and monitor school-wide initiatives which aimed to improve teacher quality and effectiveness.

This chapter presents a discussion of the results and findings under the following headings:

- Discussion of Findings (reported in Section 6.2);
- Limitations of the Study (reported in Section 6.3);
- Contributions of Study (reported in Section 6.4);
- Future Research (reported in Section 6.5); and
- Concluding Comments (reported in Section 6.6).

6.2 DISCUSSION OF FINDINGS

The discussion of findings is presented in accordance to the five research questions which formed the basis of the research. These were:

1. Are the two instruments developed to assess students' perceptions of the learning environment, students' attitudes and academic self-efficacy beliefs reliable and valid for use in secondary high schools in Western Australia? (Section 6.2.1)
2. Are teachers able to make use of student feedback (based on responses to the two instruments) to develop and implement strategies that improve students' perceptions of the classroom learning environment? (Section 6.2.2)
3. How do teachers use student feedback to guide improvements to the classroom learning environment and to implement strategies which target

issues related to students' attitudes and academic self-efficacy beliefs? (Section 6.2.3)

4. Do teachers consider the use of action research, based on student perception data, to be a worthwhile model for teacher professional development? (Section 6.2.4)
5. In what ways did the 'critical instance' school utilise student perception data for teacher professional development and to support initiatives for school improvement? (Section 6.2.5).

6.2.1 Development, Validity and Reliability of the COLES and the ASBS

The two instruments developed for this research program were the Constructivist-Oriented Learning Environment Survey (COLES), to assess students' perceptions of the learning environment and the Attitudes and Self-Belief Survey (ASBS) to assess students' attitudes and academic self-efficacy beliefs. Data collected over three years from the 10,345 students in 684 secondary high school classes were used to address the first research question which investigated the validity and reliability of the two instruments.

The COLES and the ASBS were designed to generate a range of information that would interest teachers wishing to transform their classrooms and reflect on their current practices. To achieve this, the COLES was based largely on scales drawn from a range of existing instruments which had been validated widely in the past, including the WIHIC (Fraser et al., 1996), TROFLEI (Aldridge & Fraser, 2008), ICEQ (Rentoul & Fraser, 1979) and CLES (Taylor et al., 1997). Two further scales were developed, for the purpose of this study to assess aspects related to assessment practices in the classroom – an area which has been largely overlooked in past learning environment research and one that the teachers felt was particularly pertinent. The ASBS was primarily based on an instrument developed by Aldridge and Fraser (2008) and was designed to be implemented alongside the COLES. The application of these two instruments together, provides teachers with a more complete picture of the classroom environment and the students within that environment.

The validity and reliability of both instruments were established so that teachers could be confident in the feedback that was provided to them. Trochim and Donnelly's (2008) framework for construct validity, whereby an instrument should fulfil the requirements of both translation and criterion validity, was used. A period of consultation in the first year of the study with participants (students, teachers and others with educational expertise) along with a close monitoring of the two instruments during the period of implementation ensured both face and content validity (translation validity). This process established that individual items in each scale were interpreted in ways that were intended and the scales and individual items were representative of the theoretical research base from which they were derived.

To assess criterion validity (made up of the convergent, discriminant, concurrent and predictive validity types), a sample of 10,345 students (2042 students in 2008, 4467 students in 2009 and 3836 students in 2010) in 684 classes (147 classes in 2008, 298 classes in 2009 and 239 classes in 2010) in 29 schools was involved over the three-year period. First, to assess convergent validity, the factor structure and internal consistency reliability for the actual and preferred versions of the COLES was examined. The prior factor structure for the 11 scales of both the actual and preferred versions of the COLES was replicated for data collected each of the three years of the study. All items, with the exception of three, meet the criteria, with a loading of more than 0.40 on its own scale and less than 0.40 on all other scales. The internal consistency reliability for all scales was high for all three years with the lowest alpha coefficient for any scale being 0.74 (at the class, mean and individual levels of analysis). To assess the concurrent validity, ANOVA was used to support the ability of the actual form of each of the 11 COLES scales to differentiate between classrooms. Thirdly, a component correlation matrix for each year indicated that the relationship between scales all met the minimum requirements of discriminant validity for the COLES, thus meeting the requirements for discriminant validity. Lastly, correlations between the scales of the COLES and the ASBS were examined using a two-tailed Pearson coefficient. The results support the predictive validity of the COLES.

The final version of the COLES had 67 items that assessed 11 dimensions of the classroom environment, namely, Student Cohesiveness, Teacher Support, Equity, Young Adult Ethos, Formative Assessment, Clarity of Assessment Criteria, Involvement, Task Orientation, Personal Relevance, Cooperation and Differentiation. The development and validation of the COLES adds to the suite of structurally-sound instruments available for use by classroom teachers (Fraser, 2012). Incorporated into the questionnaire was a side-by-side response format which enabled students to record their views of their actual and preferred learning environment. Importantly, the inclusion of two new scales to measure students' perceptions of assessment practices in the classroom provides opportunities for classroom practitioners to consider the role of assessment in the learning process.

Given the attitudinal nature of the ASBS, it was meaningful to determine the reliability and validity of the instrument by examining only the convergent and discriminant validity. The results found that the ASBS replicated the *a priori* two scale factor structure. The results also indicated a high internal consistency reliability for both ASBS scales and a satisfactory, if somewhat overlapping, discriminant validity for all three years of the study. The final version of ASBS had 14 items that measure two dimensions of student attitudes for a particular class, relevant to students' Attitude to Subject and Academic Efficacy (academic self-efficacy beliefs).

A key aim of this research program was to develop two economic and reliable instruments which could be used to provide student feedback to teachers. The results reported here support the validity and reliability of both the COLES and the ASBS, ensuring that data gathered using the two instruments could be used with confidence in secondary high schools in the future.

6.2.2 Pre–Post Changes in Students' Perceptions of the Learning Environment

The second research question investigated the extent to which the teachers' reflections on student perception data initiated improvements to the classroom learning environment. Over a three-year period, a total of 459 teachers (91 teachers in 2008, 210 teachers in 2009 and 158 teachers in 2010), some of whom selected more than one class, were involved in the pre–post design. The pre–post sample was

comprised of 6107 student responses (1182 student responses in 2008, 2749 in 2009 and 2176 in 2010) in 560 classes (122 classes in 2008, 248 in 2009 and 190 classes in 2010).

As part of the five-step procedure (Fraser, 2007), student feedback was provided to teachers in the form of a teacher feedback package which provided profiles and a series of complimentary data based on their students' responses to the two instruments. Two key features of the teacher feedback packages were the use of the circular profile (used to convey information generated from the COLES), the column graph (for the ASBS) and the second profile which utilised a box plot. Teachers were given additional help to make sense of the data through a workshop, small group or one-on-one session with me and were provided with some paper-based materials. After an intervention period, whereby teachers were encouraged to make changes, based on the student feedback provided to them, the COLES and the ASBS were re-administered to determine whether any shifts in students' perceptions had occurred. Teachers were then provided with information, similar to that in the first teacher feedback package (but containing post-test information), so that they could ascertain the extent of change resulting from their intervention.

For the pre–post data collected in 560 classes, the means indicated that there were improvements in students' perceptions overall. MANOVA was used to examine whether these pre-post differences were statistically significant. The results indicated that, for eight of the 11 COLES scales and for both scales of the ASBS, there were statistically significant pre–post differences. The effect sizes, according to Cohen's criteria, indicated moderately important educational changes for students' perceptions of the classroom learning environment, their attitudes and academic self-efficacy beliefs before and after the teachers' reflection and intervention. These results suggested that providing teachers with student feedback, based on students' perceptions, with which to reflect upon their teaching could be a powerful means of effecting change. It would appear that, when teachers reflect in this way, they are likely to change the classroom environment in ways that are favourable to students. This contributes to past learning environment research which has successfully involved teachers using students' perceptual measures to bring about change

(Aldridge & Fraser, 2008; Aldridge, Fraser & Sebela, 2004; Fraser & Fisher, 1986; Sinclair & Fraser, 2002; Thorpe et al., 1994; Yarrow et al., 1997).

While all teachers involved in the present study were encouraged to utilise an action research process to guide their improvement efforts, teachers in the focus group (*n*= 45 teachers) engaged in more formal action research and were monitored throughout the process. This form of teacher action research, described by Creswell (2005) as practical as opposed to participatory, required teachers to examine their own teaching and ways to improve their teaching and learning practices using a systematic and structured evidence-based classroom inquiry approach (Creswell, 2005; Lankshear & Knobel, 2004).

The study examined whether differences existed between the changes made by those teachers who used the student feedback as a basis for reflection-only (414 teachers and 508 classes) and the 45 focus teachers (52 classes) who used the feedback as part of a formal action research process. The results indicated that the post-test scores were more positive for those teachers who had used a formal approach than for their counterparts who had used the student feedback as the basis for reflection only. For all COLES scales, the average item mean was greater larger for the focus group and for six of the 11 scales, these differences were statistically significant. For one of the two ASBS scales, namely Attitude to Subject scale, the difference between post-test scores was statistically significant and more positive. For each of the scales with statistical differences, the effect sizes indicated that these differences were moderately important (Thompson, 2001).

The results suggest that, when teachers reflect on student feedback, it is likely that they will make changes to the learning environment that students perceive as more favourable. Past research has shown that the use of focused and systematic teacher development initiatives aimed at improving teacher behaviours can enhance student learning (Hill et al., 1996; OECD, 2009). In this instance, the results presented here suggest that, for teachers wishing to improve the classroom environment, it is worthwhile to not only reflect upon the data but to also engage in a more formal action research approach that involves writing an action plan and reflecting upon

each stage of the action research process. These findings reinforce the need for a more formalised approach to teacher professional development. When implemented as part of a teacher development activity, action research is an effective vehicle for effecting change in the classroom and contributes to a teacher's professional growth through the development and application of reflective practices (Cresswell, 2005). The use of teacher action research, based on students' perceptions of the classroom and themselves as learners, as professional development and the extent to which this approach supports teachers' professional growth is discussed further in Sections 6.2.3 and 6.2.4 respectively.

In addition, during the course of this research program, it became evident that, when pre–post data was utilised at the whole school level, it provided the basis for decision making that was data-driven and reflective discussion, to help monitor school improvement efforts and guide future planning. The ways that the data, generated using the COLES and the ASBS, was utilised at the school-level is discussed in Section 6.2.5.

6.2.3 Using Student Perception Data as the Basis for Teacher Action Research

The third research question aimed to investigate the ways that teachers used the student feedback to guide their improvement efforts. The findings derived from the group of 45 focus teachers, who agreed to record their activities and to be monitored while undertaking a formal action research process, suggest that student feedback generated from the COLES and the ASBS can be a valuable tool for teacher reflection and classroom change.

In the first instance, this was reflected by the changes in students' responses as illustrated in student feedback profiles for the selected classes of the 45 focus teachers. Further analysis of qualitative data collected from these teachers, comprised of interviews and written reports, summaries and reflective journals, also indicated that teachers were able to use feedback based on their students' perceptions of the learning environment, students' attitudes and academic self-efficacy beliefs to help to guide improvements to their respective classroom environments.

A close examination of the ways in which teachers utilised the feedback data as the basis for their action research showed that, while the approach often varied according to the areas being targeted for improvement the level of classroom experience and the extent to which they worked alone or collaborated with others, there were a number of features that were common to the approaches taken by all of the teachers.

First, the data provided teachers with valuable insights into how their students perceived their teaching practices and their learning experiences. All of the teachers who were involved in the research interpreted the data in ways that were meaningful to the context of their specific classes, meaning that the course of action, decided upon by the teacher, was responsive to the needs and preferences of the students in that class. These findings were supported by past research that suggests that teacher action research is characterised by teachers conducting an inquiry into one's own practice (Johnson, 2005), often within their own classrooms, for the benefit of their students. As such the feedback allowed teachers to acquire a greater understanding of their students and their teaching (as recommended by Parsons & Brown, 2002). According to Mertler (2006), providing teachers with information with which they can use to reflect on the unique characteristics of their students as they plan for change is an important component of the improvement process. Student feedback generated from the COLES and the ASBS provided the means for teachers to do just this.

Secondly, while a majority of the teachers involved in the research tended to work individually on their action research, it was during this early reflective phase, that they were most likely to consult with their colleagues or to discuss their results with their students. Teachers considered this important as it helped clarify their understanding before deciding on the best course of action for implementation. Ingvarson et al. (2005) highlight the value of professional development activities which provide teachers with opportunities to collaborate.

The early phases of action research were characterised by teachers actively using the student feedback to assist them to identify core problems, challenges or issues. All teachers drew on their personal observations of the class as well as their professional

knowledge and past experiences to help them make decisions and, in a number of instances, this prompted teachers to collect additional evidence to support their decision-making process. The evidence suggested that the teachers drew on their professional knowledge at all stages of the action research process, including when they were trying to make sense of the data to identify a core problem; devise strategies; monitor the implementation of strategies during the intervention phase; and gauge the success of their improvement efforts. The important role that existing teachers' knowledge plays in the decision-making process was highlighted as they drew on their professional knowledge and past experiences at each stage. It is this act of identifying and building on current understandings that contributes to the acquisition of new knowledge and understandings about teaching and learning which, in turn, results in a change in practice (Carr & Kemmis, 1983; Dewey, 1916; Doyle & Carter, 2003; Schön, 1983; Van Manen, 1977, 1994).

Finally, at all phases of the action research process, teachers engaged in what Dewey describes as reflective action (Dewey, 1916, 1933). When reflecting on student feedback, teacher reflections were purposeful and deliberate. Most importantly, the feedback prompted teachers to consider alternative perspectives about their teaching (Schön, 1983; Jay & Johnson, 2002) and, by doing so, provided opportunities for them to critically reflect on their practice and to form new understandings about their teaching, their students and student learning (Darling-Hammond & McLaughlin, 1995). These new understandings were transformational because they encouraged the adoption of new instructional practices (Aldridge & Fraser, 2008; Bustingorry 2008; Hoban & Hastings 2006; Rhine 1998) and bought about changes at the classroom level, resulting in improved student outcomes.

6.2.4 Teacher Action Research Based on Student Perception Data as Professional Learning

The fourth research question sought to investigate the extent to which teachers considered the use of action research, based on student feedback, to be a worthwhile model for teacher professional development. As discussed earlier, the efforts of the

focus teachers indicated that teacher action research has the capacity to bring about meaningful changes and improvements at the classroom level.

An analysis of the qualitative data, collected from the 45 focus teachers, provided insights into the ways in which the student feedback was used by teachers to improve their classrooms and highlighted its potential as a tool for reflection and teacher professional development. The results of the teacher evaluation survey in 2010 also confirmed that teacher action research, using student feedback was considered, by teachers, to be a worthwhile model for professional development as it helped them to reflect on their current teaching practices and implement strategies for improvement.

Importantly, the approach to teacher development, illustrated in the present study, was effective in helping to address the core research problem which sought to investigate ways to build teacher quality through targeted professional development that: is classroom-based; focused on student learning; fosters the development of reflective practices and provides for professional growth. This approach attempted to incorporate the key principles which best facilitate adult learning as proposed by Szabo and Lambert (2002) and provided for a number of the conditions which have drawn wide consensus amongst academics, teachers and educators as best supporting teacher development and growth (Darling-Hammond et al., 2009; Desimone, 2009; Hawley & Valli, 1999; Supovitiz & Turner, 2000).

The approach reported in this thesis supported teacher development by providing opportunities for teachers to engage in an inquiry form of teaching (Supovitz & Turner, 2000), which ensured that the teacher is in-charge of their own professional development and involved in identifying their needs and the experiences that will best support their development and growth (Guskey, 2000; Hawley & Valli, 1999). The present study was characterised by a structured and systematic approach to teacher development which utilised a five-step procedure (Fraser, 2007) and a range of support materials that provided the framework within which the teachers based their action research activities. Teachers were able to able to choose to undertake a more formalised approach which provided them with additional support, opportunities to discuss their activities with others and involved them being

monitored during the process, while others elected to work independently within the framework provided to them. This five-step approach, which involved the teacher taking on the role of decision-maker, provided for a good level of flexibility and acknowledged the important role a teacher's professional knowledge, past experiences and personal observations plays in furthering their own development, all which have been recognised as important for professional development (Creswell, 2005; Szabo & Lambert, 2002). Most importantly, the approach taken here positioned the teacher central to their own development efforts within the practical action research model (Creswell, 2005) and involved teachers actively identifying their professional learning needs and deciding upon the best course of action for improvement (as recommended by Guskey, 2000; Hawley & Valli, 1999; Ingvarson et al., 2005).

As learning occurs best in context or through experience, according to Guskey (2000) and Kolb (1984), the professional development activities reported in this thesis were situated in a real-life context (the classroom) with the intent that it would form part of teacher's day to day work (Camburn, 2010; Guskey, 2000; Harris & Grandgenett, 2002). Being classroom-based and data-driven, teachers were able to make informed professional judgements, based on evidence drawn from their classrooms. Using student feedback, gathered using the COLES and the ASBS, as the basis for teacher action research provided teachers with significant insights into the classroom learning environment through the eyes of their students, encouraging them to consider the perspectives of others to evaluate their own practice and guide their improvement efforts. Using data derived from the classroom in this way, helped to ensure that teacher development activities were directly connected to teacher practice and focused on student learning (Darling-Hammond, 2009; Hawley & Valli, 1999; Ingvarson et al., 2005).

In this way, this approach to teacher development contributed to teacher professional growth by fostering the development of reflective practices which are considered central to teaching and learning (Brookfield, 1995, 2005; Zeichner & Liston, 1987). The spiral of on-going critical reflection, characterised by the approach to action research evidenced here, supports teacher learning as a continuous and reflective

process which provides teachers with opportunities for practice and to apply their new understandings within the context of their classrooms. This contrasts sharply with experiences of professional development characterised by one-off seminars or workshops, which were traditionally conducted away from teachers' schools and supports the idea that professional development experiences for teachers which are situated in school and classroom contexts may be more effective than those that are not (Borko, 2004; Doecke et al., 2008; Putnam & Borko, 2000). Teacher action research, based on student feedback, provides opportunities for teachers to access professional development within their school context, focused on specific students and classrooms. By engaging in action research in this way, teachers were not only encouraged to become reflective practitioners but they were also able to use student feedback data in a meaningful and constructive way that enhanced their teaching practice and led to improvements in the learning environment.

According to Elmore (2000), professional growth can be supported through the building of professional learning communities which helps to foster a culture of learning. The approach presented in this thesis provided opportunities for collaboration between teachers and, on occasion, between teachers and their students. It also encouraged experimentation and the generation of new knowledge within a specific school context. The findings presented here indicated that when teachers were unable to explain actual-preferred differences or needed help to make sense of the data, they were likely to seek further clarification through discussions with their students or through consultations with their colleagues. This assisted them to make informed professional judgements about the best course of action which would address an area targeted for improvement. Such consultation fostered the emergence of informal professional learning communities where teachers were keen to share their results and to discuss their ideas with others. In some cases, it also encouraged closer collaboration and partnerships whereby some teachers collectively utilised similar strategies or sought the expertise of another teacher to assist them with their intervention. In this way, teacher action research can be seen to provide opportunities for collaboration and by doing so, provides additional collegial support which in turn helps sustain teacher development efforts (Creswell, 2005; Reeves, 2008).

6.2.5 Teacher Action Research and School Improvement

The use of teacher action research based on student perception data, at the critical instance school, was part of a multi-faceted school-level approach which aimed to improve teaching and learning practices in the school. School profiles, generated using students' responses to the two instruments, were used by the school's leadership team in two ways. The first was to monitor the level of school improvement in relation to the priorities outlined in the school's plan. In this way, the profiles were also used for reporting and accountability purposes. Second, these profiles provided an overview of the school's progress in relation to students' perceptions and proved useful in generating discussions amongst teachers and administrative staff which were both reflective and formative in nature. Such discussions helped to guide and justify future school planning in general and was used more specifically to identify the professional development needs of their teachers.

There are a number of implications arising from the data drawn from the critical instance school. First, the findings suggest that, to ensure that school improvement initiatives are effective, there are benefits to creating what Reezigt and Creemers (2005) describe as a learning organisation at the school level. Data collected from the school that formed the basis of this critical instance case study demonstrated the existence of a shared vision and commitment to continuous learning, which according to Reezigt and Creemers (2005) are two important elements which exist in an improving school with an improvement culture. It would appear that the ability of this school to consistently demonstrate levels of improvement (as indicated by the analysis of whole-school data) over the three-year period may be attributable to the school's organisation culture and processes which can be seen to actively support its teachers to become reflective practitioners (Reezigt & Creemers, 2005).

The findings imply that it is worthwhile for schools to consider the use of teacher action research to help to establish notions of 'distributed leadership' (Crowther, 2010; Reeves, 2008). In this way, rather than a top-down approach, school improvement begins in the classroom, involves teachers actively taking note of

students' views of the learning environment created in their classes and examining the problem, challenge or issues that become evident. Reflective practices which are fostered in teachers through action research activities (which help teachers to decide which aspect of their teaching they wish to change) may play an important role in encouraging teachers to improve the quality of their teaching.

The findings also suggest that, when schools consider using teacher action research as a tool for teacher professional development, it is likely to be effective when used as part of a whole-school initiative for school improvement. In this way, teachers involved in the action research process are able to draw on assistance from colleagues, leaders in the school and other resources provided by the school. In this respect, the findings suggest that an approach like the one taken by the critical instance school, which openly targeted and actively supported teacher professional development with the aim of improving the quality of their teaching, may contribute to the building and maintenance of a positive school culture which promotes continuous learning and encourages teachers to put into practice teaching and learning strategies consistent with the school's vision. These findings provide further support to the body of research which has shown that teacher development measures implemented as part of a whole-school approach contribute to school improvement by improving teacher quality and student outcomes and help to build positive school cultures (Darling-Hammond, 2009; Desimone, 2009; Doecke et al., 2008; Reezigt & Creemers, 2005).

Finally, the findings suggest that student feedback, based on instruments, such as the COLES and the ASBS, may provide useful information with which the school can use to gauge the success of their school improvement efforts as outlined in their school plan and assist in their planning for future school improvement. The reflective discussions which resulted from an examination of whole-school data at the critical instance school provides further support to earlier research which suggests attempts for school improvement need to focus primarily on what happens in the classroom (Rowe, 2004, 2007; Townsend, 2007). As illustrated in the research reported in this thesis, an emphasis on the development of reflective practices at both the classroom and whole-school level may also help to involve the wider school community in

school improvement efforts. Such efforts contribute to the development of what Reezigt and Creemers (2005) would describe as a school culture which openly values ideas of continuous learning and improvement and highlights the important role that school context can play in supporting teacher professional growth (Clarke & Hollingsworth, 2002).

6.3 LIMITATIONS OF THE STUDY

The present study involved a number of limitations that need to be considered before generalising the findings to other contexts. First, given the voluntary and confidential nature of the involvement of schools and teachers, there was little control with respect to the make-up of the sample. To minimise this limitation and to ensure that a range of schools and participants were included (to enhance the external validity and generalisability of the results), a number of strategies were employed. While no teacher was specifically targeted for this study, at each school site, care was taken to ensure that the selection of classes involved a range of school subjects and student ability levels within each learning area. Each year teachers were able to select the class that they would prefer to administer the survey to – and this often changed from year to year. To ensure that all teachers were given an opportunity to be involved in the action research process, schools were encouraged to ensure that different teachers from each learning area were involved from year to year.

Second, two issues emerged during the development and piloting of the two instruments, these being, survey fatigue and low literacy levels. As detailed in Chapter 4, to combat these issues, a number of refinements were made to the wording of items, and the number of items per scale, reduced. To specifically address survey fatigue, in schools where there were large numbers of students surveyed over an extended period of time, schools were encouraged to plan their survey administration carefully to limit the number of times that any one student would complete the survey. The issues of survey fatigue and low literacy levels highlighted the importance of encouraging teachers to discuss their results with their students to help to clarify their responses and to correct any misconceptions or anomalies which may appear in the student feedback.

It is acknowledged that factors, other than the teacher intervention, could have influenced the pre–post changes in students' perceptions of their classroom learning environment (such as school context, passage of time and growth in student maturity and outlook). While these factors could have influenced student perceptions, it could be argued that the level of change in such a large sample over a relatively short intervention period can be attributed to the actions of the teachers over that time rather than school, student characteristics or other external factors.

For the critical instance school, there are a range of factors, not related to the research carried out in this study, which could suggest that features unique to the critical instance school (including the context, the selection and make-up of staff, student cohort characteristics and a range of school improvement initiatives were in place in the school over the period of research), which could have contributed to the change in results (showing a cycle of continuous improvement over the three years). For the purpose of this study, the critical instance school proved to be a good example of how one school purposefully linked the activities of their teachers engaged in the research activities to their school improvement initiatives. This school used feedback information, based on school-level data, as part of a reflective process which involved the wider school community, particularly the school leadership team, as the basis for discussion and as a means to monitor, evaluate, gauge and report on the success of their school improvement initiatives.

6.4 CONTRIBUTIONS OF THE STUDY

The research presented in this thesis investigated the viability of using students' perceptual measures for teacher development and classroom improvement. This investigation was based on the assumptions that teachers are genuinely interested in and committed to improving their teaching, that systematic and purposeful reflection is an effective medium through which worthwhile change can be brought about and that students, as major stakeholders in the education process, can provide meaningful and valid feedback information about the learning environment in which their learning occurs. The findings indicated that teacher professional development, which utilises teacher action research based on student feedback, provides teachers with

powerful learning opportunities within an authentic learning environment – their classrooms.

This research had two key methodological contributions. The first contribution was the development and validation of the COLES and the ASBS. These two instruments have the potential to provide valuable data to classroom practitioners that can be used to prompt valuable reflections to guide them to implement classroom changes to improve their classroom learning environments. Existing instruments which have sought to assess classroom learning environments have tended to focus on relationships and instructional processes, while excluding the important aspects and role of assessment in student learning. Therefore, it is significant that the research, reported in this thesis involved the development and validation of a new instrument, the COLES, that includes dimensions that measures students' perceptions of the extent to which teachers use formative assessment and are clear about assessment criteria.

The second key methodological contribution was the adoption of a multi-method research design (Morse, 1991, 2003) in which quantitative and qualitative methods were successfully employed simultaneously within two concurrent and interrelated investigations. In this case, a deductive theoretical drive utilising quantitative methods was selected to validate and assess the reliability of the two instruments developed for part A of the research program whereas a more inductive approach was more appropriate to investigate Part B of the research program (which utilised mostly qualitative methods to investigate the ways teachers used student perception data to reflect, plan and implement strategies to improve the classroom learning environment). As described by Taylor and Bogden (1998), an approach which is largely inductive is characterised by theories being derived from, and based on, the data collected, rather than the data being collected to test a hypothesis. In this example, an inductive theoretical drive provided for the identification of the critical instance case study (Anderson, 1998) which, in turn, provided an opportunity to examine how one school linked the activities of their teachers involved in the research to school improvement initiatives. The multi-method design provided for the selection and use of appropriate methods to suit different aspects of the research

program to be examined and, as a result, provided broader perspectives and greater depth of understanding about the use of student perception data by teachers, the role of teacher action research and school improvement.

On a practical level, the reflective nature of the research reported in this thesis, which involved encouraging teachers to examine their teaching practices through the eyes of their students, offers promise. The two instruments provided a useful and economical means to access student feedback which could be used by teachers for the purposes of reflecting on their teaching. This feedback provides teachers with an opportunity to step back from their teaching and to reflect on what they do in an objective and analytical manner. By providing teachers with student feedback, derived from their own classrooms, teachers are provided with the opportunity to 'act as researchers of their own practice' and to 'take charge' of their own professional learning. This enables them to make informed professional judgements about the best course of action which will improve their teaching practices, lead to improved learning environments and enhance student outcomes.

The results and findings highlight the potential of using student feedback for teacher professional development that utilises an action research process and which provides authentic opportunities for teachers to link what they know about teaching, learning and assessment to the immediate classroom context. This contributes to similar studies which have encouraged teachers to seek alternative perspectives to help guide their professional development efforts (Aldridge & Fraser, 2008; Bustingorry, 2008; Hoban & Hastings, 2006; Schön, 1983, 1987) and contributes to and extends past teacher action research which has been successful in improving classroom environments (Aldridge & Fraser, 2008; Fraser & Fisher, 1986; Sinclair & Fraser, 2002; Thorp et al., 1994; Yarrow et al., 1997).

An important contribution of this study is its reporting of four case studies regarding the ways in which teachers used students' responses to two instruments as part of teacher action research aimed at improving the learning environment. These four case studies, presented as third person narratives, provided a good illustration of how teachers in the focus group approached their data. Importantly, the pre–post data

analysis which showed moderately important differences between learners' perceptions in the reflection-only group and the focus group suggests the need for a more-structured approach to teacher action research in future attempts to improve learning environments. The adoption of a systematic and structured approach is also important to teacher development efforts which aim to foster professional growth.

The efforts of the critical instance school to first, link their teacher's action research activities into school improvement initiatives which sought to improve the quality of teaching and learning through targeted teacher development and; secondly, utilise the data as a means to monitor their school improvement initiatives, highlight the potential value of student perceptual measures being used to inform and guide whole-school improvement efforts. Such efforts have the capacity to build teacher quality, improve the classroom learning environment, enhance student outcomes and by doing so, contribute to whole school improvement efforts.

6.5 FUTURE RESEARCH

The qualitative findings indicated that teachers used a range of strategies as part of their intervention. It is recommended that further research involve examining the types of strategies that were most likely to successfully improve the learning environment and whether these differ for different learning areas. In addition, it could be worthwhile examining the nature and types of strategies used to target a particular scale or dimension. This information would help to identify appropriate or effective strategies which can be used to address perceived gaps or concerns for a specific scale.

Further research is needed to explore whether teachers using student feedback for improving the learning environment are likely to be more successful when working collaboratively than working alone.

According to Sykes (2002), the effectiveness of teacher professional development would be better measured by resulting increases in student productivity as measured by student achievement performance. Given the associations between learning environment and student outcomes (Fraser, 2012), it is suggested that future

research, supported by empirical evidence, is required to investigate the extent to which teacher action research, based on student feedback, contributes to improved student cognitive outcomes.

Future research could also examine whether using feedback, based on students' perceptions of the learning environment, in conjunction with support at the school-level (such as the provision of additional, targeted professional development), might provide teachers with additional support during the action research process and improve the effectiveness of the professional development. The ability of the critical instance school in the present study to consistently demonstrate levels of improvement over the period of research suggests that it would be useful to investigate the contextual and school factors to better understand the processes and elements which may contribute to effective school improvement.

6.6 CONCLUDING COMMENTS

The present study resulted in the development of two instruments which can be used, alongside each other, to provide teachers with valid and reliable feedback information about how students perceive the classroom learning environment and their attitudes towards learning. The results and findings presented in this thesis, suggests that, generally, teachers are able to use feedback, based on students' perceptions of the learning environment, their attitudes and academic self-efficacy beliefs, in a meaningful and constructive way that is likely to enhance teaching practice and to improve the classroom environment in ways that are more constructivist and responsive to the needs and preferences of specific group of students.

The research activities, such as those described in this thesis, which involved teachers engaging in practical action research, provides teachers with a valuable opportunity for professional development and professional growth. Activities which result in improvements in classroom learning environments and enhanced student affective and cognitive outcomes, which build teacher quality and contribute to school improvement processes, should be important goals for teacher professional development. To better support teacher learning and build capacity for professional

growth, teacher development activities should be systematic, classroom-based and supported by a constructivist methodology – which directs the focus of teachers squarely on students and their learning. These activities should also be school-based and provide targeted teacher development which is linked to school priorities. Such efforts would help to support and sustain school improvement efforts, particularly those which seek to improve the quality of teaching and learning and enhance student outcomes.

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APPENDIX A

GUIDE TO ACTION RESEARCH AND TEACHER PLANNING SHEET

REFLECTING
TO DO – Working alone or with colleagues, examine your class profiles to identify gaps or discrepancies between students' actual and preferred responses. At this stage of the process you could consider: • Why things are the way they are now? Can you account for what you see in the profiles? Is a particular issue or problem evident? Why is it important? • What could improve these results? What tells you that the strategies you are thinking of using could be effective in addressing the issue or concern? What do other people think about this? What questions could I ask the class about the profiles? • What are you learning about in terms of teaching and learning in relation to the key problem or issue? About students and their learning generally? About your teaching? • What problem or issue you would like to address? What is the scope of the issue or initiative? Next step *On the basis of your reflection, decide what you should do next?*
↓
PLANNING
TO DO – Working with colleagues or alone, you might consider the following: • What do you want to achieve? • What strategies will you choose to achieve this? • What support or expertise is required? What other resources will you need and how will you secure them? • What information will you gather to help make sound judgements? When and how will you do this? What help will you get from others? Next step *Use the teacher planning sheet to document your ideas, strategies and possible actions.*
↓
ACTING
TO DO – As you put your plan into action, consider the following: • What do you need to do before putting the plan into action? • Who else might need to be involved in the action? Monitoring your plan, as you put it into action. • What are you noticing as you put your plan into practice? • What adjustments to your plan are required as a result of the observations being made while taking the planned action? Next step *Collect evidence to make your judgements* • Is the evidence that you are collecting likely to help you make a judgement about what has happened or changed as a result of your actions? • What other evidence might be required?
↓
DESCRIBING
TO DO – Consider the following: • What happened when you implemented your plan of action? • What were the effects or results of the action? • Who did what, when, for how much of the time, with whom? Next step *Using your reflective journal, provide an account of what happened when the plan was implemented.*
↓
REFLECTING
TO DO – Using the post-test results, analyse the evidence collected to work out how effective your strategies or actions were. • What does the evidence tell you about the effectiveness of the action? • Can you interpret this evidence in other ways? Next step *On the basis of your reflection, what should you do next?*

TEACHER PLANNING SHEET (Example)

Teacher:		School:			
My teaching, learning and assessment strategies will focus on:	What my profile tells me:	Possible problem, issue or challenge:	My Plan – What will I do to transform the learning environment:		
			Strategy	Resources/ Other	Timeline
Teacher Support *(The extent to which the teacher helps, befriends, trusts and is interested in students)* Task Orientation *(The extent to which it is important to complete activities planned and to stay on the subject matter)* Young Adult Ethos *(The extent to which students are given responsibility for their own learning and treated like young adults)*	My profile showed that there was a large gap between the actual and preferred scores in these areas. I think that this might be due to a larger-than-normal group of students who are particularly vocal and negative. I think it's possibly that this group is having a negative influence on the perceptions of the rest of the class.	After discussing the issues with the quieter students in the class, I found that they felt that they did not have as many opportunities to participate in the class as they would like. They felt that: • my support appeared to be centred on the more boisterous group leaving them feeling that they were not a valued part of the class → *need to give more time to these students so that they will feel valued?* • there was no opportunity for discussion and they often were not sure if they were doing tasks correctly → *provide opportunities for students to get assistance from me?* • When they voiced their opinions, they were often sneered at or 'talked over' by the boisterous students → *improve the environment so that all students feel that they can learn more effectively?* • During class discussions, the boisterous students made it clear that they felt that my class was not of particular value to them, claiming that they already knew much of the content → *provide alternative delivery methods***?**	1. Devise an alternative for students using online resources at the school. 2. Provide the course online, including numerous supporting documents to assist students. 3. Provide a list of tutorial topics to be discussed for each lesson and allow students to choose either to attend the classes or work independently in the adjoining classroom. 4. During or after each tutorial, use time to visit those students who working independently on the computers to talk, ask questions and ensure they are on task. 5. Introduce 'a code of conduct' for the operation of the tutorials.	WEBCT Computer room and adjoining classroom.	(6 weeks) Commence Week 1, Term 3 

APPENDIX B

OVERVIEW FOR THE PRE-TEST SAMPLE SHOWING THE NUMBER OF TEACHERS, CLASSES AND STUDENTS FOR EACH YEAR OF THE STUDY

OVERVIEW OF PRE-TEST SAMPLE

		YEAR								
		2008			2009			2010		
School number	Location	Teachers	Classes	Students surveyed	Teachers	Classes	Students surveyed	Teachers	Classes	Students surveyed
1.	Metropolitan	10	12	183	5	8	133	5	6	95
2.	Metropolitan	21	38	483	0	0	0	0	0	0
3.	Metropolitan	1	2	28	6	7	80	0	0	0
4.	Metropolitan	9	9	113	4	4	54	5	5	46
5.	Regional	11	18	260	5	5	80	0	0	0
6.	Metropolitan	10	18	276	17	25	387	17	21	347
7.	Regional	8	8	110	6	5	80	9	9	152
8.	Metropolitan	12	16	258	7	8	148	16	16	309
9.	Metropolitan	25	26	331	22	27	364	23	28	393
10.	Metropolitan				24	24	391	23	24	390
11.	Metropolitan				31	31	516	12	12	208
12.	Metropolitan				8	8	106	8	8	104
13.	Regional				7	11	148	4	7	99
14.	Metropolitan				5	5	78	0	0	0
15.	Metropolitan				16	16	391	0	0	0
16.	Metropolitan				6	14	159	0	0	0
17.	Metropolitan				2	2	27	5	6	71
18.	Metropolitan				10	16	229	17	26	426
19.	Metropolitan				6	8	175	2	2	56
20.	Metropolitan				4	4	44	0	0	0
21.	Metropolitan				11	11	129	8	8	104
22.	Metropolitan				6	12	131	4	7	83
23.	Metropolitan				9	10	102	3	4	43
24.	Metropolitan				11	13	200	4	4	61
25.	Metropolitan				10	10	162	0	0	0
26.	Metropolitan				10	13	153	4	7	102
27.	Regional				0	0	0	6	6	40
28.	Metropolitan				0	0	0	2	4	69
29.	Metropolitan				0	0	0	17	29	638
	TOTAL	107	147	2042	249	297	4467	194	239	3836

APPENDIX C

PRE–POST OVERVIEW SHOWING THE NUMBERS OF TEACHERS, CLASSES AND STUDENTS FOR EACH YEAR OF THE STUDY

OVERVIEW OF PRE-POST SAMPLE

		YEAR											
		2008				2009				2010			
School number	Location	Teachers	Classes		Students surveyed	Teachers	Classes		Students surveyed	Teachers	Classes		Students surveyed
1.	Metropolitan	7	3		91	4	7		67	5	6		46
2.	Metropolitan	16	29		273	0	0		0	0	0		0
3.	Metropolitan	1	2		21	5	6		54	0	0		0
4.	Metropolitan	7	7		67	4	4		35	4	4		27
5.	Regional	8	11	(4)	113	0	0		0	0	0		0
6.	Metropolitan	10	18		192	17	25	(4)	290	17	21	(6)	247
7.	Regional	7	7	(5)	65	5	6	(5)	60	7	7	(4)	81
8.	Metropolitan	10	13		153	6	7		100	12	12		170
9.	Metropolitan	25	26	(6)	207	21	26	(4)	198	21	25	(3)	201
10.	Metropolitan					22	22		244	20	21	(3)	268
11.	Metropolitan					28	28	(2)	386	11	11	(2)	160
12.	Metropolitan					8	8		71	8	8		70
13.	Regional					6	10		119	0	0		0
14.	Metropolitan					4	4		53	0	0		0
15.	Metropolitan					16	16		319	0	0		0
16.	Metropolitan					4	9		80	0	0		0
17.	Metropolitan					1	1		6	5	6		48
18.	Metropolitan					10	16		169	12	18		231
19.	Metropolitan					0	0		0	2	2		52
20.	Metropolitan					4	4		27	0	0		0
21.	Metropolitan					11	11		88	7	7		66
22.	Metropolitan					4	4		35	4	7		40
23.	Metropolitan					5	6		48	2	3		11
24.	Metropolitan					7	9		97	4	4		46
25.	Metropolitan					9	9		103	0	0		0
26.	Metropolitan					9	10		100	4	7		77
27.	Regional					0	0		0	0	0		0
28.	Metropolitan					0	0		0	2	4	(4)	47
29.	Metropolitan					0	0		0	11	17		288
	TOTAL	91	122	(15)	1182	210	248	(15)	2749	158	190	(22)	2176

(*n*) indicates the number of focus classes, per school, per year.

APPENDIX D

CONSTRUCTIVIST-ORIENTED LEARNING ENVIRONMENT SURVEY

Source of scales:

Student Cohesiveness; Teacher Support; Equity; Involvement; Task Orientation and Cooperation scales adapted from the WIHIC (Fraser et al., 1996).

Young Adult Ethos scale adapted from the TROFLEI (Aldridge & Fraser, 2008).

Personal Relevance scale adapted from the CLES (Taylor et al., 1997).

Differentiation scale adapted from the ICEQ (Fraser, 1990).

ALL SCALES USED WITH PERMISSION FROM THE AUTHORS

	ACTUAL					PREFERRED				
Student Friendship	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
1. Members of this class are my friends.	1	2	3	4	5	1	2	3	4	5
2. I know other students in this class.	1	2	3	4	5	1	2	3	4	5
3. I make new friends among students in this class.	1	2	3	4	5	1	2	3	4	5
4. I am friendly to members of this class.	1	2	3	4	5	1	2	3	4	5
5. I work well with other class members.	1	2	3	4	5	1	2	3	4	5
6. Students in this class like me.	1	2	3	4	5	1	2	3	4	5
Teacher Support	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
7. The teacher considers my feelings	1	2	3	4	5	1	2	3	4	5
8. The teacher helps me when I have trouble with the work.	1	2	3	4	5	1	2	3	4	5
9. The teacher talks with me.	1	2	3	4	5	1	2	3	4	5
10. The teacher takes an interest in my progress.	1	2	3	4	5	1	2	3	4	5
11. The teacher moves about the class to talk with me.	1	2	3	4	5	1	2	3	4	5
12. The teacher's questions help me to understand.	1	2	3	4	5	1	2	3	4	5
Equity	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
13. The teacher gives as much attention to my questions as to other students' questions.	1	2	3	4	5	1	2	3	4	5
14. I get the same amount of help from the teacher as do other students.	1	2	3	4	5	1	2	3	4	5
15. I have the same amount of say in this class as other students.	1	2	3	4	5	1	2	3	4	5
16. I receive the same encouragement from the teacher as other students do.	1	2	3	4	5	1	2	3	4	5
17. I get the same opportunity to contribute to class discussions as other students.	1	2	3	4	5	1	2	3	4	5
18. I get the same opportunity to answer questions as other students.	1	2	3	4	5	1	2	3	4	5

	ACTUAL					PREFERRED				
Young Adult Ethos	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
19. I am treated like a young adult.	1	2	3	4	5	1	2	3	4	5
20. I am given responsibility.	1	2	3	4	5	1	2	3	4	5
21. I am expected to think for myself.	1	2	3	4	5	1	2	3	4	5
22. I am regarded as reliable.	1	2	3	4	5	1	2	3	4	5
23. I am considered mature.	1	2	3	4	5	1	2	3	4	5
24. I am given the opportunity to be independent.	1	2	3	4	5	1	2	3	4	5
25. I am encouraged to take control of my learning.	1	2	3	4	5	1	2	3	4	5
Formative Assessment	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
26. I use feedback from assessment tasks to improve my learning.	1	2	3	4	5	1	2	3	4	5
27. Assessment tasks help me to understand the topic.	1	2	3	4	5	1	2	3	4	5
28. I can see a link between classroom activities and the assessment tasks I do.	1	2	3	4	5	1	2	3	4	5
29. Assessment tasks help me to identify weaknesses in my understanding.	1	2	3	4	5	1	2	3	4	5
30. Assessment tasks help me to monitor my own learning.	1	2	3	4	5	1	2	3	4	5
31. Assessment tasks are an important part of my learning.	1	2	3	4	5	1	2	3	4	5
Clarity of Assessment Criteria	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
32. I am aware of which activities and tasks are used to assess my performance.	1	2	3	4	5	1	2	3	4	5
33. I know what types of information are needed to complete an assessment task.	1	2	3	4	5	1	2	3	4	5
34. The instructions for assessment tasks are clear to me.	1	2	3	4	5	1	2	3	4	5
35. I know how to complete assessment tasks successfully.	1	2	3	4	5	1	2	3	4	5
36. I understand how the teacher judges my work.	1	2	3	4	5	1	2	3	4	5
37. I know how to complete different assessment tasks.	1	2	3	4	5	1	2	3	4	5

	ACTUAL					PREFERRED				
Involvement	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
38. I discuss ideas in class.	1	2	3	4	5	1	2	3	4	5
39. I give my opinions during class discussions.	1	2	3	4	5	1	2	3	4	5
40. The teacher asks me questions.	1	2	3	4	5	1	2	3	4	5
41. My ideas and suggestions are used during classroom discussions.	1	2	3	4	5	1	2	3	4	5
42. I explain my ideas to other students.	1	2	3	4	5	1	2	3	4	5
43. I am asked to explain how I solve problems.	1	2	3	4	5	1	2	3	4	5
Task Orientation	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
44. Getting a certain amount of work done is important to me.	1	2	3	4	5	1	2	3	4	5
45. I am ready to start this class on time.	1	2	3	4	5	1	2	3	4	5
46. I set my own goals for this class.	1	2	3	4	5	1	2	3	4	5
47. I pay attention during this class.	1	2	3	4	5	1	2	3	4	5
48. I try to understand the work in this class.	1	2	3	4	5	1	2	3	4	5
49. I know how much work I have to do.	1	2	3	4	5	1	2	3	4	5
Personal Relevance	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
50. I relate what I learn in this class to my life outside of school.	1	2	3	4	5	1	2	3	4	5
51. What I learn in this class is relevant to my day to day life.	1	2	3	4	5	1	2	3	4	5
52. I apply my everyday experiences in this class.	1	2	3	4	5	1	2	3	4	5
53. This class is relevant to my life outside of school.	1	2	3	4	5	1	2	3	4	5
54. In this class, I get an understanding of life outside of school.	1	2	3	4	5	1	2	3	4	5
55. I apply what I already know to the work in this class.	1	2	3	4	5	1	2	3	4	5
Cooperation	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
56. We work in groups (or pairs) in this class.	1	2	3	4	5	1	2	3	4	5
57. When I work in groups in this class, there is teamwork.	1	2	3	4	5	1	2	3	4	5
58. I work with other students on assignments in this class.	1	2	3	4	5	1	2	3	4	5
59. I cooperate with other students on class activities.	1	2	3	4	5	1	2	3	4	5
60. I share my books and resources with other students when doing class work.	1	2	3	4	5	1	2	3	4	5
61. I learn from other students in this class.	1	2	3	4	5	1	2	3	4	5

	ACTUAL					PREFERRED				
Differentiation	Almost Never	Seldom	Some-times	Often	Almost Always	Almost Never	Seldom	Some-times	Often	Almost Always
62. I am able to work at the speed which suits my ability.	1	2	3	4	5	1	2	3	4	5
63. Students who work faster than others are able to move on to the next topic.	1	2	3	4	5	1	2	3	4	5
64. I can choose topics I wish to study.	1	2	3	4	5	1	2	3	4	5
65. Tasks are suited to my interests.	1	2	3	4	5	1	2	3	4	5
66. Tasks are suited to my ability.	1	2	3	4	5	1	2	3	4	5
67. I am able to do work that is different from other students in this class.	1	2	3	4	5	1	2	3	4	5

APPENDIX E

ATTITUDES AND SELF-BELIEF SURVEY (ASBS)

Scales adapted from work by Aldridge and Fraser (2008)

SCALES USED WITH PERMISSION FROM THE AUTHORS

		ACTUAL				
Attitude to Subject		Almost Never	Seldom	Some-times	Often	Almost Always
68.	I look forward to lessons in this subject.	1	2	3	4	5
69.	Lessons in this subject are fun.	1	2	3	4	5
70.	Lessons in this subject interest me.	1	2	3	4	5
71.	This subject is one of my favourite school subjects.	1	2	3	4	5
72.	There should be more lessons in this subject.	1	2	3	4	5
73.	I enjoy the activities that we do in this subject.	1	2	3	4	5
74.	These lessons have increased my interest in this subject.	1	2	3	4	5
Academic Efficacy		Almost Never	Seldom	Some-times	Often	Almost Always
75.	I am good at this subject.	1	2	3	4	5
76.	I find it easy to get good grades in this subject.	1	2	3	4	5
77.	My friends ask me for help in this subject.	1	2	3	4	5
78.	I find this subject easy.	1	2	3	4	5
79.	I outdo most of my classmates in this subject.	1	2	3	4	5
80.	I feel that I will achieve a good result in this subject.	1	2	3	4	5
81.	I help my friends with their class work in this subject.	1	2	3	4	5

APPENDIX F

TEACHER EVALUATION SURVEY

THE QUESTIONNAIRE

a. The questionnaire was comprised of items indicative of effective learning environments.
b. The questionnaire provided a valid representation of how the students perceived their learning environment.
c. The questionnaire items included the sorts of things that would interest a classroom teacher.

TEACHER FEEDBACK PACKAGES

a. Information in the pre-test feedback package helped me to identify possible issues, challenges or issues with a particular class (or classes).
b. The circular profile provided a good overview of how students responded to the questionnaire.
c. The box plots helped me to further identify areas of concern or interest.
d. The item breakdown helped me to devise strategies to target a particular area.
e. Information in the post-test feedback package gave me a good indication of whether or not the strategies I implemented were successful.

TEACHER PROFESSIONAL DEVELOPMENT

a. Involvement in this study helped me to reflect on my current teaching practices.
b. Changes or improvements can be made to the learning environment based upon feedback provided by students.
c. Using student feedback to guide my reflections and actions is a worthwhile model for teacher professional development.

DATA FOR REFLECTION

In terms of reflective practice; once you received your feedback, did you? Please mark all that apply to you.

- work individually?
- work collaboratively with another teacher or a group of teachers?
- pursue some form professional development outside of your immediate school context to help you with your identified problem, challenge or issue?
- access some form of professional development or existing program within your immediate school context to help you with your identified problem, challenge or issue?
- put in place strategies that you used in the past or were already aware of?

TEACHER INVOLVEMENT

Please indicate the extent of your involvement in this Study. Please mark all that apply to you.

- I volunteered to take part.
- It was voluntary but I was encouraged by my school to be involved.
- It was part of a school based PD and was linked to our curriculum development plan.
- I used my involvement in this study for my performance management.
- I used (or intend to use) my involvement in this study as evidence for the teacher registration (to fulfil the professional learning requirement).
- I used my involvement in this study for an application (a promotional position, e.g. Level 3 teacher or Senior Teacher).

Please note that for each section, space was provided for teachers to provide further comment if desired.

APPENDIX G

SEMI-STRUCTURED INTERVIEW PROTOCOL – STUDENTS

STUDENT INTERVIEW QUESTIONS

I have a few questions related to a survey which each of you responded to recently for your teacher.

1. Do you have any questions about the survey and why your teacher has asked you to complete it?
2. You will notice that the survey is made up of two parts, the first section relates to the learning environment.
3. For each of the main headings, I would like one of you to read through each item (one at a time), then as a group, I would like you to talk to each other about what you thought the item was referring to and the ways you responded to this? I will stop and ask you questions along the way as we go.
4. The second section relates to how you feel about this subject.
5. Do you have any questions about the two main headings (Attitude to Subject and Academic Efficacy)
6. For the items under Attitude to Subject, I would like one of you to read through each item (one at a time), then as a group, I would like you to talk to each other about what you thought the item was referring to and the ways you responded to this? As with the first part of the survey, I will stop and ask you questions along the way as we go.
7. What did you think about when completing the survey?
8. Why do you think your teacher asked you to take part in this activity?
9. Did your teacher talk about the survey results with you? If so, what sorts of things did your class talk about?
10. Did you notice any changes in the way your teacher did things in the classroom? Explain.

APPENDIX H

SEMI-STRUCTURED INTERVIEW PROTOCOL – FOCUS TEACHERS

GENERAL INFORMATION

1. Learning area.
2. Gender
3. How many years of teaching (overall)?
4. How many years at your current school?
5. Government/non-government school?

INTERVIEW QUESTIONS (Teacher Feedback Information – Pre-Test)

1. Which class or classes were surveyed?
2. Why did you choose to work with this particular class?
3. What sort of class are they? (academic, difficult, sociable etc)
4. What was your initial response to the data in your teacher feedback package?
5. What did this tell you about your students/classroom?
6. How could you account for this?
7. Did you share this information with your students? If so, what was their response and what sorts of things did they say?
8. After examining your data, what did you decide to do?

FOLLOW-UP QUESTIONS

Pre-Post

1. Can you briefly summarise the nature of your planned intervention which was based on student feedback for the pre-test?
2. What strategies did you employ as part of this intervention?
3. Why did you decide on that course of action?
4. Can you describe an example of what you did and what happened as a result?
5. What did you learn from your research –
6. In terms of teaching?
7. In terms of student learning?
8. What did you notice in your student feedback for the post-test?
9. What connection do you see between your results and your planned intervention?
10. Aside from the data, did you notice any improvements/changes in your students?
11. Have you shared your findings?

The survey instruments and teacher feedback packages

1. Can you provide some feedback on the survey in terms of its:
2. Strengths?
3. Weaknesses?
4. Effectiveness – in terms of the types of feedback you would be interested in?
5. Accuracy – to what extent do you feel the survey provides a valid representation of how your students perceived the classroom learning environment?
6. Can you provide some feedback on the teacher feedback information, in terms of a) Visual appeal and b) The information being conveyed?
7. Usefulness to you as a teacher or for professional development
8. Usefulness for the action research process?

Professional Development

1. How would you describe your approach or attitude towards professional development?
2. For what reasons do you undertake professional learning/development?
3. List the types of professional development activities that you have engaged in.
4. Of these activities, which do you consider to be the most effective?
5. What types of professional development do you feel most contribute towards your learning and professional growth?
6. Thinking about last year – when you participated in a range of professional development activities (either self or school-initiated activities), what level of support was afforded to you from your school, education sector or professional body?
7. What level of support do you desire or would you expect while undertaking professional learning?
8. Can you see a link between the classroom environment and the types of professional learning that you undertake?
9. Do you incorporate the professional learning you have undertaken into what you do in the classroom?
10. Thinking about the activities you engaged in as part of this study, in terms of professional development, would you consider it to be worthwhile (why/why not)?

APPENDIX I

SEMI-STRUCTURED INTERVIEW PROTOCOL – CRITICAL INSTANCE SCHOOL

LEADERSHIP TEAM (CRITICAL INSTANCE SCHOOL)

1. How would you describe your school's approach towards teacher professional development?
2. How would you describe your own personal approach (or the attitude of teachers at your school) towards teacher professional development?
3. For what reasons are professional development activities undertaken at your school?
4. List the types of professional development activities that your school/teachers engage (other than this study).
5. Of these activities, which do you consider to be the most effective?
6. Can you give some reasons why you consider these to be most effective?
7. How has your school used the whole school data provided through your teachers' involvement in this study?
8. When teachers undertake professional development activities (either self or school-initiated activities), what level of support is provided to them from the school, education sector or professional body?
9. What level of support does your school provide to teachers while undertaking professional development?
10. Can you see a link between the classroom environment and the types of professional learning which your teachers engage with?
11. What evidence suggests that your teachers incorporate this professional learning into their classroom practice?

APPENDIX J

END OF YEAR FORUM AGENDAS FOR 2008, 2009 AND 2010

2008 FORUM AGENDA	
8.45am	Coffee and registration
9.00am	Opening address
9.15am	One teacher's journey
9.35am	Actions, strategies and conclusions (Group activity) *Participants will have the opportunity to discuss the approach, types of projects and strategies undertaken at schools during the year*
10.15am	Morning tea
10.35am	Overview of the research program Preliminary analysis – the findings so far…
10.55am	*Profiling activity (Group activity)* *Profiles generated across the 2008 sample will be used to identify links between profile types and effective learning environments in the senior school context*
11.35am	Reflection and suggestion *Critique of the process used in 2008* *Next steps and directions for 2009*
11.50am	Evaluation
12noon	Lunch

2009 FORUM AGENDA	
8.45am	Coffee and registration
9.00am	Overview of the research program and Preliminary analysis – the findings to date
9.25am	Professional learning – principles and practice
9.40am	One teacher's journey
10am	Morning Tea
10.20am	Actions, strategies and conclusions *A discussion of the various approaches, types of activities and strategies undertaken by teachers over the year (Activity 1).*
10.50am	Evidence based decision making in the classroom – *an evaluation* *Opportunities for critical evaluation, reflection and suggestion (Activity 2).*
11.25am	Evidence based decision making in the classroom – *what makes it work?* *An examination and evaluation of three models (Activity 3).*
11.55am	Plenary
12noon	Lunch

2010 FORUM AGENDA	
8.45am	Coffee and registration
9.00am	Welcome and overview
9.10am	Teacher stories
9.25am	Actions, strategies and conclusions (small groups) *Activity 1: A round robin discussion of the various approaches, types of activities and strategies undertaken by teachers over the year.*
10.10am	Morning Tea
10.30am	Generating classroom solutions *Activity 2: Possible strategies and ideas that help to close the 'gaps'*
11am	Evaluating the Constructivist-Oriented Learning Environment Survey (COLES) *Activity 3: Ranking exercise*
11.25am	A tool for Teacher professional development? *Activity 4: How does it compare with other teacher PD?* *Activity 5: Strengths, weaknesses and possible improvements*
11.55am	Plenary
12noon	Lunch

Please note that names of participants and presenters have been removed to preserve confidentiality.

APPENDIX K

TEMPLATE FOR TEACHER SUMMARIES AND WRITTEN REPORTS

TEACHER SUMMARY SHEET

Name:		School/Learning Area:	
Project Aim:			
Project Description:			
EFFECTIVENESS OF PROJECT			
Positive Aspects		Negative Aspects	

How did the project contribute to?

My teaching strategies and practice?	The learning environment that students perceive?	My assessment strategies and practices

WRITTEN REPORT

Action Learning Project Report		Date:	
Name:		School:	

MY NOMINATED CLASS (classes)

I decided to survey this particular class (or classes) because…

PLANNING - *Please provide an overview of your planning for this project*

What aspect of my teaching did I want to do differently? *E.g. provide new ways for me to support my students:*

What selected strategy/strategies did I plan to use to help me with this?

What did I need to learn? About the planned strategies? About learning and teaching? *E.g. What professional learning can I access to help me with this? OR What particular skills or knowledge do I need to learn before I proceed?*

What other evidence (aside from the data received from the study) did I collect to ascertain any changes/to evaluate the strategies implemented? *E.g. Journal records and reflections, products from my students, observations, student reflections*

What professional learning did I undertake?

ACTION - *Please provide an overview of your actions*

What did I do? *Outline the strategies, activities and experiences which formed the basis of my intervention.*

REFLECTION AND RECORDING

Essentially, what did I hope to achieve at the beginning of the plan? Was it achieved? How did I know?

What did I learn from my research?

- *In terms of my teaching and teaching in general?*
- *In terms of students' learning?*

Did I see any improvement in my students?

Have I shared my findings/experiences with anyone else? Do I plan to share my findings with others? (at learning area level/school level/sector level)

So where to from here? Would I try this again? What do I want to try next?