Outcomes-Focused Learning Environments
ADVANCES IN LEARNING ENVIRONMENTS RESEARCH
Volume 1

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Scope

The historical beginnings of the field of learning environments go back approximately 40 years. A milestone in the development of this field was the establishment in 1984 of the American Educational Research Association (AERA) Special Interest Group (SIG) on Learning Environments, which continues to thrive today as one of AERA’s most international and successful SIGs. A second milestone in the learning environments field was the birth in 1998 of Learning Environments Research: An International Journal (LER), which fills an important and unique niche.

The next logical step in the evolution of the field of learning environments is the initiation of this book series, Advances in Learning Environments Research, to complement the work of the AERA SIG and LER. This book series provides a forum for the publication of book-length manuscripts that enable topics to be covered at a depth and breadth not permitted within the scope of either a conference paper or a journal article.

The Advances in Learning Environments Research series is intended to be broad, covering either authored books or edited volumes, and either original research reports or reviews of bodies of past research. A diversity of theoretical frameworks and research methods, including use of multimethods, is encouraged. In addition to school and university learning environments, the scope of this book series encompasses lifelong learning environments, information technology learning environments, and various out-of-school ‘informal’ learning environments (museums, environmental centres, etc.).
Outcomes-Focused Learning Environments

Determinants and Effects

Jill M. Aldridge
Curtin University of Technology, Australia

Barry J. Fraser
Curtin University of Technology, Australia
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During my appointment as foundation principal at Sevenoaks Senior College, I drew heavily on effective schools research to guide my own leadership. It seemed to me that, in essence, school effectiveness factors came down to five groupings:

- the effectiveness of the leadership (my own and our administration team)
- the degree of parent involvement and commitment
- the effectiveness of teachers as supporters of young people
- the effectiveness of teachers as teachers
- the degree to which students respond positively to the opportunities presented.

From the outset, we worked to establish an outcomes focus to learning at Sevenoaks based on two key principles. First, the starting point for learning is what a student already knows and understands about a particular topic. Teachers must be clear about their students’ current levels of knowledge, understanding and skills, as well as about the next stage at which they need to be engaged. The teacher then develops appropriate programs or learning strategies, implements these, and assesses the students’ progress towards the next level. Students who don’t reach the next level are given extra support to enable them to reach their optimum levels. Second, the teacher and the school are accountable for the outcomes of each and every student.

In practical reality, life in a Year 11 classroom with 25 students is not straightforward. Students learn at different rates and in different ways. They have different levels of motivation, home support, maturity and background in the subject. What happens in a classroom is far more diverse and organic than it is predictable. Despite the obvious limits imposed by group instruction and the extraneous personal, social and emotional factors that each young person brings to class, I believe that we should continue to aspire towards our idealistic goal – to ensure that all students achieve to their optimum level.

The establishment of an outcomes focus to learning has changed the way in which we operate compared with a ‘regular school’ (if such a school exists). Most of these changes have evolved over our first five years of operation, and I anticipate that this evolution will continue.

An important aspect of this evolution has been the constant monitoring of the outcomes that we achieve. I have unyielding faith in teachers to do the right thing by students, but I am not sure that we are always as objective as we might be. Generally speaking, if we implement ideas or changes, then we quickly develop very strong ownership of the resulting programs and are often reluctant to question their effectiveness. We need to be able to step back and evaluate our students’ outcomes and programs in an objective and analytical manner. At Sevenoaks, we rely heavily on feedback from various data sources. In reviewing our performance, we undertake detailed analysis of a range of data, including students’ results, parent feedback, teacher feedback and student feedback. Because we need to adopt an outcomes focus at all levels of our operation (individual, classroom and whole-
school), we need to know where we are currently and to work towards achieving future targets. Solid evidence is needed on which to base judgements of our performance.

One source of data used each year at Sevenoaks has been students’ responses to a questionnaire assessing their perceptions of their actual and preferred classroom learning environment. The feedback information provided by students is used at different levels to provide data to: 1) the teacher, who uses feedback information about his/her classes to guide the implementation of classroom strategies that are likely to enhance one or more elements of the classroom environment; 2) administrators, who can gauge the school’s overall performance in terms of providing a learning environment that is likely to enable an outcomes focus.

DAVID WOOD
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JILL M. ALDRIDGE & BARRY J. FRASER
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CHAPTER 1

INTRODUCTION

In countries around the world, there has been much attention given to the benefits and problems related to outcomes-focused education. Frequent media coverage has questioned whether or not outcomes-focused education should even be introduced. Although the media, politicians, educators and parents all seem to have opinions about outcomes-focused education, unfortunately, very little of this is based on any evidence. The dearth of literature and research related to the implementation of outcomes-focused education makes it difficult for various stakeholders to make informed decisions and to form opinions that go beyond anecdotal or subjective information. Consequently, our study at a senior college in Western Australia was initiated for the purpose of monitoring the evolution of the learning environment and student attitudes as administrative staff and teachers implemented an outcomes-focused learning environment.

This introductory chapter encompasses four topics. First, the notion of outcomes-focused education, especially how it is interpreted in Western Australia and at the specific school at which our research was conducted, is clarified. Second, as our study drew on the field of classroom learning environments, a succinct review of literature from this field is provided. Third, some salient features of the design and methods of our study (e.g. questionnaires and samples) are introduced. Fourth, to provide a road map for readers of this book, the structure of the other five chapters is briefly overviewed.

OUTCOMES-FOCUSED EDUCATION

Outcomes-focused education has been heralded as a means of preparing students for a competitive global economy and workforce in the 21st Century (Education Commission of the States, 1995; Kerka, 1998). Countries around the world have been adopting outcomes-focused education as a model for reform in school and post-school education and training systems, including the United Kingdom (also known as competency-based education) (e.g., Faris, 1998), New Zealand (Bell, Jones, & Carr, 1995), Canada (Hopkins, 2002), South Africa (Botha, 2002) and, to some extent, the United States (also known as performance-based education) (e.g., Evans & King, 1994). Common arguments in favour of outcomes-focused education are that it: promotes high expectations in students; prepares students for life and work in the 21st Century; fosters more authentic forms of assessment; and encourages decision making regarding curriculum and teaching methods at all levels (Education Commission of the States, 1995).
The adoption of an outcomes-focused approach to teaching and learning in countries around the world has been surrounded by debate and concerns that encompass both theory and implementation (Kerka, 1998). Critics have argued that the approach is concerned with values and attitudes rather than with objective information, conceptually confused, empirically flawed and inadequate (Berlach, 2004; Capper, 1994; Hyland; 1994; Jansen, 1998; McKernan, 1993; Schlafly, 1993; Waghid, 2003; Wein & Dudley-Marling, 1998). However, the focus for this book is not the subjective criticisms associated with outcomes-focused education, but rather how the pedagogy associated with an outcomes-focused philosophy can be implemented and how schools might use information collected using students’ perceptions in monitoring the development of outcomes-focused learning environments.

A review of literature related to outcomes-focused education suggests a dearth of past research associated with its implementation and success at the high school level. Most publications since the turn of the century appear to be centred on theoretical issues concerned with outcomes-focused education (Andrich, 2002; Spady, 2004; Waghid, 2003) and the implementation of outcomes-focused education in South Africa (Aldridge, Laugksch & Fraser, 2006; Aldridge, Laugksch, Seopa & Fraser, 2006; Botha, 2002; Onwu, & Mogari, 2004; Todd & Mason, 2005) and at the postsecondary level (de Jager & Nieuwenhuis, 2005; Hoogveld, Paas & Jochems, 2005). Therefore, our study of outcomes-focused education and its implementation in an innovative upper-secondary school in Western Australia provides a timely starting point.

Clarifying the Meaning of Outcomes-Focused Education

There have been numerous interpretations of what constitutes outcomes-focused or outcomes-based education. Outcomes-focused education can be viewed as a theory (or philosophy) of education that is built on a set of assumptions about “learning, teaching and systemic structures in which these activities take place” (Killen, 2001, p. 1). William Spady is not the only person to have made a contribution to outcomes-focused education, but generally he is regarded as a world authority on the subject and his publications (Spady, 1994, 1998) have provided a description of the theory underpinning outcomes-focused education. Spady (1994, p. 1) writes:

Outcome-Based Education means clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences. This means starting with a clear picture of what is important for students to be able to do, then organizing the curriculum, instruction, and assessment to make sure this learning ultimately happens.

Outcomes-focused education is an approach to planning, delivering and assessing in which one first determines the required results, then identifies the skills and knowledge required to achieve those results. This requires administrators, teachers and students to focus on the desired results of education and what the student can
INTRODUCTION

actually do after they have been taught. Such a focus requires a shift away from a system in which teachers often taught from a syllabus, irrespective of a student’s readiness to learn at that level, to describing the outcomes expected of all students as a basis for: curriculum development; teachers’ design of learning programs; and development of instructional materials and assessment (Spady, 1988). Because all curriculum and teaching decisions are based on facilitating the desired student outcomes (Curriculum Council, 2001; Griffin & Smith, 1997), there is an emphasis on catering for student individual differences, interests and learning styles.

Within this broad philosophy of outcomes-focused education, there are two common approaches: the traditional/transitional approach; and the transformational approach (Spady, 1993). According to Forlin and Forlin (2002, p. 18) “traditional outcomes reflect the curriculum based objectives that highlight how successfully students learn”. The traditional/transitional approach favours students’ mastery of subject-related content and can be described as involving curriculum-based objectives. It is argued by Willis and Kissane (1995) that The National Curriculum (England and Wales) (which focuses on covering the curriculum within a fixed timeframe) and the 5–14 Development Program for Scotland (in which movement to the next level is dependent on completion of the previous level) both fall into this category.

Transformational-outcomes education, on the other hand, describes exit outcomes that are cross-curricular and of long-term significance beyond the classroom. Such outcomes are likely to focus on broader issues that are related to a person’s life roles, such as being a “self-directed learner, complex thinker or community contributor” (Forlin & Forlin, 2002, p. 18), and might include problem solving or working cooperatively. Spady (1994) is convinced that a truly outcomes-based education includes a curriculum that is designed around complex role performances in real situations with real demands. Willis and Kissane (1995) cite The Common Curriculum and Provincial Standards (Ontario) as an example of a transformational approach to outcomes-based education whose design is based on expected outcomes and which acknowledges that students require differing lengths of time to achieve the outcomes. Spady (1994) advocates a transformational approach in preference to a traditional/transitional approach as he believes that it leads to more significant learning.

OUTCOMES-FOCUSED EDUCATION IN WESTERN AUSTRALIA

Curriculum reform in Western Australia evolved from the Common and Agreed National Goals of Schooling. In April 1989, State, Territory and Commonwealth Ministers of Education met as the Australian Education Council in Hobart. Ministers made a historic commitment to improving Australian schooling within a framework of national collaboration by reaching agreement to address the areas of common concern embodied in 10 Common and Agreed National Goals for Schooling in Australia that were released as part of the Hobart Declaration (Australian Education Council, 1989). In April 1999, State, Territory and Commonwealth Ministers of Education met as the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA, 1999) in Adelaide. Ministers endorsed a
new set of National Goals for Schooling in the Twenty-First Century that were known as the Adelaide Declaration.

According to Parker (2003), outcomes-focused education in Western Australia is part of a package of reforms that was the result of two main drivers. The first concern was that the education system, as it stood, was not sufficiently responsive to students needs in a time of increasing change (e.g., technological advances, increasing cultural diversity, global environmental issues and changing family and institutional structures). An inclusive curriculum was needed to overcome inequities in the education system. The second driver was public expectation in relation to accountability and standards. The introduction of outcomes-focused education in Western Australia was seen as part of the solution. Whilst the Western Australian model of outcomes-focused education draws on overseas models, it retains unique aspects that address the specific needs of students in Western Australia.

A major review of the curriculum in Western Australia, chaired by Theresa Temby (Temby, 1995), resulted in the development of the Curriculum Framework (Parker, 2003). The review outlined a number of curriculum needs and recommendations. In 1997, a statutory body, the Curriculum Council of Western Australia, was established to work within the Western Australian Curriculum Council Act to oversee the development and implementation of the Curriculum Framework.

The development of the Curriculum Framework was chaired by Lesley Parker and involved a highly-collaborative and highly-consultative approach that encompassed almost 10,000 teachers, parents, students, academics, curriculum officers and other members of the community (Curriculum Council, 2001). The Curriculum Framework provides, for all students, an outline of common learning outcomes upon which schools and teachers can build educational programs. The Curriculum Framework is outcomes-focused and explicitly advocates a change in teaching and learning approaches. The Curriculum Framework states: “An outcomes approach means identifying what students should achieve and focusing on ensuring that they do achieve. It means shifting away from an emphasis on what is to be taught and how and when, to an emphasis on what is actually learnt by each student” (Curriculum Council, 2001, p. 14).

When developing any curriculum, values play a major role. In the development of the Curriculum Framework, core shared values (in the form of Overarching and Learning Area Statements) were identified to strengthen and shape it. The Overarching Statement provides the principles that underpin the curriculum, specifies the major “knowledge, skills, values and attitudes that all students are expected to acquire” and provides coherence across all of the curriculum areas through all of the years of study, making for a “seamless and integrated curriculum experience for students” (Parker, 2003, p. 25). Each of the eight Learning Area Statements gives support to the Overarching Statement and contributes to the students’ achievement of the Overarching Learning Outcomes (Curriculum Council, 2001). The Curriculum Council’s website (www.curriculum.wa.edu.au) provides further information about the philosophy of outcomes-focused education and teaching-learning materials in different learning areas.
The introduction of outcomes-focused education in Western Australia for K–12 began in 1997. In 2004, outcomes-focused teaching became compulsory for K–10 and, in 2005, a Parliamentary Inquiry into changes to the post-compulsory curriculum in Western Australia examined the merits of the proposed changes (in terms of the readiness of the education system and the effects of extending outcomes-focused curriculum, assessment and reporting to upper secondary education).

ESTABLISHING AN OUTCOMES FOCUS AT SEVENOAKS

Our study was conducted at an innovative new school, Sevenoaks Senior College, commencing during its first year of operation. Sevenoaks is located in a lower socioeconomic suburb of Perth, Western Australia, and has a student population from a wide range of social and cultural backgrounds. The school is positioned at the top of the lowest socioeconomic index quartile. The unique ICT infrastructure built into Sevenoaks is intended to facilitate an outcomes-focused curriculum that allows the integration of ICT into the delivery of programs, and it provides online curriculum and electronic information-management systems to teachers and students.

Sevenoaks Senior College has catered for Year 11 and 12 students since it first opened in 2001. The inaugural Principal (who is now the CEO of the Curriculum Council in Western Australia) was the stimulus for our research. Keen to implement and monitor an outcomes-focused learning environment, he approached us about conducting the study reported in this book. Further information about Sevenoaks, including the history and philosophy of the school, can be found at www.sevenoaks.wa.edu.au.

Because this significant reform of schooling (K–12) has been occurring since 1997, many teachers in the Western Australian education system are now familiar with outcomes-focused education. Sevenoaks Senior College first opened its doors in 2001, at which time the Principal was keen that teachers continue with the implementation of an outcomes-focused approach to teaching and learning at the school.

According to Killen (2001), outcomes-focused education can be viewed in three ways: as a theory of education; as a systemic structure for education; or as classroom practice. To achieve genuine outcomes-focused education, these three aspects need to be in place. The teachers and administrative staff of Sevenoaks accepted the challenge to translate the theory of outcomes-focused education into action and to make a shift in the way in which they teach, from a focus on what they teach to a focus on what students learn.

With a strong administrative team focused on the implementation of an outcomes-focused education, teachers at Sevenoaks were encouraged to adopt new teaching and learning approaches. The administrative staff provided a supportive environment in which teachers were able to try out and discuss new ideas. The Principal identified two key elements that were necessary to establish an outcomes focus to learning at the school. The first was recognition of the need to identify the starting point for learning in terms of what the student already knows and to design
learning programs and instructional aids to facilitate student progress to the next level. The second element was recognition that the teacher and the school were accountable for the outcomes of the student.

Since the school opened its doors, there has been a strong push to establish a ‘young adult ethos’ in which the power relationship between teacher and students is on a more equal footing and students are given responsibility for their learning. The Principal acknowledged that the practical reality is not straightforward and that: “What happens in a classroom is far more diverse and organic than it is predictable… Despite the obvious limits imposed by group instruction and the extraneous personal, social and emotional factors that each young person brings to the class, I believe that we should continue to aspire towards our idealistic goal – to ensure that all students achieve to their optimum level.”

Sevenoaks boasts a staffroom that includes teachers from all learning areas. The physical layout of the staffroom and lunch area promote a more collaborative and cross-curricular focus on the implementation of new ideas. It was decided that, as a useful tool for facilitating the transition to a more outcomes-focused learning environment, teachers would assess and make use of the perceptions of the students to inform and guide changes made in their classrooms.

Given that outcomes-focused education is being introduced (during 2005–2009) at the senior school level in Western Australia, together with the lack of research related to the effectiveness of outcomes-focused education, this book provides timely and useful information about how an instrument can be used to help teachers to change their pedagogy in ways that are likely to make their classrooms more outcomes focused and how administrators can use the information to monitor changes within the school. Although the information is not conclusive, and a further study that involves other schools is being conducted at present, still it provides some ideas and implications for educational systems both within and outside Western Australia in terms of how outcomes-focused learning environments can be created.

FIELD OF CLASSROOM LEARNING ENVIRONMENTS

Because the research described in this book drew upon and contributed to the field of classroom learning environments, this section provides a succinct review of some of the literature from this field. Past work on learning environments furnished numerous conceptual models, research traditions, assessment techniques and research methods relevant to our study.

The current field of learning environments has been shaped by several influential figures over the years. Lewin (1936) initiated the idea that personal behaviour is a result of the interaction between the individual and his/her environment. Murray (1938) expanded upon this idea by considering additional effects within the system, namely, that an individual’s behavior is affected internally by characteristics of personality (needs) and externally by the environment itself (press). This was later expanded by Stern, Stein, and Bloom (1956), who proposed that differences can exist between an individual’s perceptions, a group’s perceptions, and the perceptions
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of an external observer of a single environment. The notion of person-environment fit has been elucidated by Hunt (1975), Stern (1970) and Fraser and Fisher (1983).

Walberg proposed a nine-factor model of educational productivity in which student outcomes are codetermined by three student aptitude variables, the quantity and quality of instruction, and the psychosocial environments of the school/class, the home, the peer group, and the mass media (Fraser, Walberg, Welch & Hattie, 1987; Walberg, 1981). The model holds that no single factor alone has a huge impact on learning and, to lift the tide of achievement, several factors need to be aligned and raised simultaneously. Therefore, it would do less good to raise a factor that already is high than to improve a factor that currently is the main constraint to learning. Empirical probes of the educational productivity model were made by carrying out extensive research syntheses involving the correlations between student outcomes and the factors in the model (Fraser, Walberg, Welch & Hattie, 1987; Walberg, 1986) and secondary analyses of large data bases collected as part of the National Assessment of Educational Achievement (Walberg, 1986) and National Assessment of Educational Progress (Fraser, Welch & Walberg, 1986; Walberg, Fraser & Welch, 1986). Classroom and school environment was found to be a strong predictor of both achievement and attitudes even when a comprehensive set of other factors was held constant.

Herbert Walberg and Rudolf Moos independently pioneered the use of participant perceptions of various learning settings (Anderson & Walberg, 1968; Moos, 1974, 1979; Walberg, 1979; Walberg & Anderson, 1968). Research and evaluation related to Harvard Project Physics led Walberg and Anderson (1968) to develop the Learning Environment Inventory (LEI). Moos (1974) developed a scheme for classifying human environments into three dimensions (relationship, personal development, and system maintenance and change) to enable the classification and sorting of various components of any human environment. This led Moos to the development of the Classroom Environment Scale (CES) (Moos, 1979; Moos & Trickett, 1974), which linked his work in other human environments to school settings.

Following the pioneering research of Walberg and Moos in the USA, two further programs of learning environment research emerged, one in the Netherlands and one in Australia. In the Netherlands, Wubbels and his colleagues began ambitious programmatic research focusing specifically on the interaction between teachers and students in the classroom and involving use of the Questionnaire on Teacher Interaction (QTI; Fraser & Walberg, 2005; Wubbels & Brekelmans, 1998; Wubbels & Levy, 1993). Subsequently, research on teacher-student interaction involving use of the QTI spread to numerous countries including Korea (Kim, Fisher & Fraser, 2000), Brunei (Scott & Fisher, 2004), Singapore (Goh & Fraser, 1998; Quek, Wong & Fraser, 2005a, 2005b) and Australia (Henderson, Fisher & Fraser, 2000).

In Australia, Fraser and his colleagues began programmatic research which first focused on student-centred classrooms and involved use of the Individualised Classroom Environment Questionnaire (ICEQ; Fraser, 1980, 1990). Subsequently, other specific-purpose instruments were developed in Australia and crossvalidated and applied for a variety of research purposes around the world. In particular, these
questionnaires include the Science Laboratory Environment Inventory (SLEI; Fraser, Giddings & McRobbie, 1995; Henderson, Fisher & Fraser, 2000; Lightburn & Fraser, 2007; Wong & Fraser, 1996), Constructivist Learning Environment Survey (CLES; Kim, Fisher & Fraser, 1999; Nix, Fraser & Ledbetter, 2005; Spinner & Fraser, 2005; Taylor, Fraser & Fisher, 1997) and the What Is Happening In this Class? (WIHIC; Aldridge, Fraser & Huang, 1999; Dorman, 2003; Fraser & Chionh, 2000; Martin-Dunlop & Fraser, 2008; Ogbuehi & Fraser, 2007; Wolf & Fraser, in press).

More recently, Asian researchers have conducted numerous studies with large sample sizes (Fraser, 2002), cross-validated several questionnaires in English-speaking countries (e.g., Singapore and Brunei), and completed the laborious task of translating, back-translating, and validating these instruments in the Chinese, Indonesian, Korean, and Malay languages (Aldridge, Fraser & Huang, 1999; Kim, Fisher & Fraser, 2000; Lee, Fraser & Fisher, 2003; Margianti, Aldridge & Fraser, 2004; Scott & Fisher, 2004). Asian researchers have used learning environment assessments in educational program evaluation (Khoo & Fraser, 2008; Teh & Fraser, 1994) and in investigations of associations between student outcomes and the nature of the classroom learning environment (Goh, Young & Fraser, 1995; Quek, Wong & Fraser, 2005a, 2005b; Wong, Young & Fraser, 1997). Most recently, learning environments research has been taken up in South Africa (Aldridge, Fraser & Sebela, 2004; Aldridge, Laugksch & Fraser, 2006; Aldridge, Laugksch, Seopa & Fraser, 2006).

There have been many classroom environment studies conducted around the world with a variety of purposes over the past 30 years (Fisher & Khine, 2006; Fraser, 1998a, 1998b, 2007; Goh & Khine, 2002). A strong theme in past classroom learning environment research has involved investigations into associations between students’ cognitive and affective learning outcomes and their perceptions of psychosocial characteristics of their classroom environments (Fraser & Fisher, 1982; Haertel, Walberg & Haertel, 1981; McRobbie & Fraser, 1993). Numerous studies have shown that students’ classroom environment perceptions, relative to students’ background characteristics, are more closely associated with learning outcomes. For example, the What Is Happening In this Class? (WIHIC) questionnaire (Aldridge, Fraser & Huang, 1999; Fraser, Fisher & McRobbie, 1996) has been utilized in conjunction with the Test of Science-Related Attitudes (TOSRA; Fraser, 1981) in investigating associations between the learning environment and students’ affective and cognitive outcomes in numerous studies with large samples of students around the world (Aldridge, Fraser & Huang, 1999; Koul & Fisher, 2005; Telli, Rakici & Cakiroglu, 2003; Zandvliet & Fraser, 2004, 2005).

One of the major applications of learning questionnaires in past research has been as a source of process criteria of effectiveness in the evaluation of educational innovations. For example, the use of learning environment criteria have illuminated the impact of new educational programs or approaches, including computer-assisted learning (Maor & Fraser, 1996; Teh & Fraser, 1994), computer courses for adults (Khoo & Fraser, 2008), inquiry-based science instruction for middle-school students (Wolf & Fraser, in press) and an innovative science course for prospective elementary students (Martin-Dunlop & Fraser, 2008).
In other research, links between educational environments have also been explored (Dorman, Fraser & McRobbie, 1997; Fraser & Kahle, 2007; Marjoribanks, 1991; Moos, 1991). Cross-national studies have also been conducted to explore educational practices, beliefs and attitudes that differ between countries, and which could lead to suggestions for improving educational practices or identifying unique cultural characteristics of each location (Aldridge & Fraser, 2000; Aldridge, Fraser & Huang, 1999; Aldridge, Fraser, Taylor & Chen, 2000; Dorman, 2003; Dorman, Adams & Ferguson, 2003). In an interesting application of learning environment ideas, Ferguson and Fraser (1998) investigated changes in classroom learning environment across the transition from primary to secondary school.

In the past, researchers have investigated various determinants of classroom environment. For example, several studies have revealed that, relative to males, females tend to perceive the same classroom environments more favourably (Quek, Wong & Fraser, 2005a, 200b; Teh & Fraser, 1995). Studies that have investigated both students’ and teachers’ perceptions of both actual and preferred classroom environment have revealed that, first, teachers tend to perceive the same classroom environments more favourably than their students and, second, both teachers and students prefer a more favourable classroom environment than the one perceived to be actually present (Byrne, Hattie & Fraser, 1986; Fisher & Fraser, 1983). Grade-level and ethnic differences in classroom environment perceptions have been reported by Castillo, Peiro and Fraser (2006).

Teachers can use feedback information based on assessment of students’ actual and preferred classroom learning environment as a basis for guiding practical improvements in their classroom environments. The five steps that have been used commonly in past research are (1) assessment, (2) feedback, (3) reflection and discussion, (4) intervention and (5) reassessment (Fraser & Fisher, 1986). This technique has been applied successfully in case studies reported in England (Thorp, Burden & Fraser, 1994), South Africa (Aldridge, Fraser & Sebela, 2004) and Australia (Yarrow, Millwater & Fraser, 1997).

DESIGN AND METHODS

Although the study reported in this book mainly involved quantitative data collection, it also included important qualitative information to provide insights into how teachers used student responses to improve their classroom environment. Combining quantitative and qualitative methods in learning environment studies has been advocated by Tobin and Fraser (1998). This section briefly identifies some key factors of the research design and methods used in our study that are elaborated in more detail later in this book.

Assessment of Learning Environment

Because a major thrust of our study was the assessment and monitoring of classroom learning environments that both have an outcomes focus and are technology-rich, the conceptualisation, development, validation and use of a questionnaire called the Technology-Rich Outcomes-Focused Learning Environment
Inventory (TROFLEI) is a major focus of this book. Chapter 2 describes the TROFLEI’s development and validation in considerable detail.

As described in more detail in Chapter 2, an outcomes-focused classroom learning environment provides an emphasis on the following 10 dimensions which form the scales of the TROFLEI: student cohesiveness (students knowing, helping and supporting each other); teacher support (the teacher supporting and being interested in students); involvement (students being encouraged to participate in discussions, ask questions and share ideas); task orientation (the teacher ensuring that students know what needs to be achieved and stay on task); investigation (emphasis on problem-solving and inquiry); cooperation (students cooperating rather than competing with each other to complete tasks); equity (the teacher providing an inclusive environment in which all students are valued); differentiation (the teacher catering for differences in students’ abilities, rates of learning and interests); computer usage (extent to which students use computers in various ways for email, accessing the internet, discussion forums, etc.); and young adult ethos (teachers giving their students responsibility for their own learning).

Assessment of Student Attitudes

Another focus of our study was to monitor the attitudes developed by students experiencing outcomes-focused learning environments. Therefore, as described in Chapter 2, we needed to develop, validate and use a student attitude questionnaire. This instrument consists of 18 items in three scales, namely, Attitude to Subject, Attitude to Computer Use and student Academic Efficacy. The first scale, Attitude to Subject, is based on a scale from the Test of Science-Related Attitudes (TOSRA, Fraser, 1981). The second scale, Attitude to Computer Use, is adapted from the Computer Attitude Scale (CAS) developed by Loyd and Gressard (1984) and later modified by Newhouse (2001). The third scale, Academic Efficacy, is based on a scale developed by Jinks and Morgan (1999).

Sample

Our study utilised a number of different ‘grain sizes’ (Fraser, 1999a) and different sample sizes. At the largest grain size, a sample of students from two Australian states, namely, Western Australia and Tasmania, was used in investigating the validity and reliability of the new instrument (Chapter 2) and for investigating outcome-environment associations (Chapter 4). This sample consisted of 2317 students in 166 classes in 10 senior colleges (i.e. schools catering for Grades 11 and 12 only). The sample was selected to be representative of students in these two states, and was made up of 45.1% of students from examination-oriented courses and 54.9% of students from wholly school-assessed courses. In terms of gender, 48.3% of the students were male and 45.9% were female (3.8% of students did not record their gender). Table 1 provides a further description of this large-scale sample.

In order to provide a large and more generalisable sample for the validation of the questionnaires, the sample included schools from Tasmania as well as Western
INTRODUCTION

Australia. It was considered prudent to include these schools for two reasons. First, Tasmania was introducing outcomes-focused education statewide at the senior-school level, whereas the implementation of outcomes-focused education at the time of this study was not compulsory. Second, at the time of this study, there was a push for the integration of ICT into schools in Western Australia. It should pointed out that, in Western Australia, most government senior high schools cover Years 8–12 and senior colleges, such as Sevenoaks, are ‘alternative’ high schools covering Years 11–12 for specific groups. In Tasmania, all government high schools cover Years 7–10 only and all students must change over to a senior college for Years 11–12.

Table 1. Description of Large-Scale Sample

<table>
<thead>
<tr>
<th>State</th>
<th>Sample Size</th>
<th>Course</th>
<th>Year Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Examination Oriented</td>
</tr>
<tr>
<td>Western Australia</td>
<td>769</td>
<td>698</td>
<td>629</td>
</tr>
<tr>
<td>Tasmania</td>
<td>350</td>
<td>366</td>
<td>415</td>
</tr>
<tr>
<td>Total</td>
<td>1119</td>
<td>1064</td>
<td>1044</td>
</tr>
</tbody>
</table>

a 134 students didn’t provide information about gender. 
b 32 students didn’t provide information about year level.

At the next grain size, the study involved investigating how one school, namely, Sevenoaks Senior College, used information from the TROFLEI and attitude scales to monitor the development of outcomes-focused learning environments over four years (see Chapter 3). Obtaining the sample for this part of the study was highly dependent on teachers’ willingness to be involved in the study and their personal selection of classes for involvement in action research (see Chapter 5). Notably, in 2001, the foundation year at the school, teachers and administrative staff decided that the sample should only include classes that were made up of predominantly Year 11 students. The sample for the data collected over the four years at Sevenoaks is summarised in Table 2.

Table 2. Description of School-Level Sample

<table>
<thead>
<tr>
<th>Year</th>
<th>Gender</th>
<th>Sample Size</th>
<th>Year Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Examination Oriented</td>
</tr>
<tr>
<td>2001</td>
<td>264</td>
<td>173</td>
<td>209</td>
</tr>
<tr>
<td>2002</td>
<td>271</td>
<td>325</td>
<td>254</td>
</tr>
<tr>
<td>2003</td>
<td>249</td>
<td>207</td>
<td>166</td>
</tr>
<tr>
<td>2004</td>
<td>165</td>
<td>192</td>
<td>147</td>
</tr>
</tbody>
</table>

a 3.8% of students didn’t provide their gender and 0.6% of students didn’t provide their year level. 
b As this was the school’s foundation year, teachers were reluctant to involve their Year 12 students.
CHAPTER 1

At the smallest grain size, qualitative data were obtained from three case-study classes that were involved in the action research component of the study (see Chapter 5). The selection of the three classes was based largely on the teachers’ willingness to be involved in the study. In each case, observations were carried out regularly during a 12-week period. Interviews were conducted at various times during and after the 12-week period in order to clarify points and to enhance understanding of the strategies that the teachers implemented and whether teachers felt that the strategies were effective. In one case, a teacher wrote a description of the analysis of student responses and how strategies were developed and implemented. In the other two cases, the descriptions were based on interviews. In each case, the teachers were given the resulting descriptions to ensure that they were accurate portrayals of what had taken place. In two of the three classes, the selection of students for interviewing was undertaken collaboratively by the teacher and researchers.

STRUCTURE OF THE BOOK

This book is organised into five further chapters. Chapter 2 describes the development and validation of a questionnaire that was used for assessing students’ perceptions of their actual and preferred classroom learning environments. Because the classroom learning environment created by teachers during the implementation of an outcomes-focused curriculum is crucially important for its success, we used the field of learning environments (Fraser, 2007) to provide an appropriate framework for this study. We examined the Curriculum Framework (Curriculum Council, 2001) to identify learning environment characteristics that are salient for outcomes-focused learning and then developed corresponding learning environment scales for assessing these characteristics. This led to the development and validation of a widely-applicable questionnaire called the Technology-Rich Outcomes-Focused Learning Environment Inventory (TROFLEI, Aldridge, Dorman & Fraser, 2004).

Chapter 2 reports how the responses of 2317 students from 166 classes in Tasmania and Western Australia were analysed to provide evidence of the validity and reliability of the TROFLEI when used at the senior high school level across a number of different school subjects. Separate exploratory factor analyses supported the 10-scale a priori structure of both the actual and preferred forms of the TROFLEI. Additionally, the use of multitrait-multimethod modelling, within a confirmatory factor analysis framework, with the 10 scales as traits and the two forms of the instrument (actual and preferred) as methods, further supported the TROFLEI’s construct validity.

Chapter 3 describes how data collected using the TROFLEI were used in monitoring the success of educational programs aimed at promoting outcomes-focused and ICT-rich classroom learning environments at Sevenoaks Senior College. To monitor the evolution of outcomes-focused, technology-rich learning environments over the first four years of the school’s operation, the TROFLEI was administered to students at the end of the school year in 2001, 2002, 2003 and 2004. The sample
INTRODUCTION


To evaluate the educational programs at Sevenoaks in terms of changes over four years (2001, 2002, 2003 and 2004), one-way MANOVAs were conducted separately with the set of actual TROFLEI scales and the set of attitude scales as the dependent variables and the year as the independent variable. In each case, the multivariate test yielded significant results in terms of Wilks’ lambda criterion, indicating that there were differences between years for the set of criterion variables as a whole. Therefore, the univariate ANOVA was interpreted for each individual environment and attitude scale. Tukey’s HSD post hoc procedure was used to identify for which pairs of years differences in scale scores were statistically significant. Also, effect sizes were calculated (as recommended by Thompson, 1998, 2001) to estimate the magnitudes of the differences between each pair of years expressed in standard deviation units.

Chapter 4 reports our investigation of some determinants and effects of outcomes-focused learning environments. First, this chapter reported our investigation of differences between the learning environments perceived and preferred by students enrolled in university-entrance examination subjects and wholly school-assessed subjects. Past studies (e.g., Aldridge, Huang & Fraser, 1999) have suggested that the learning environments created in examination-oriented classes are likely to differ from those which are not examination-oriented. If teachers are to improve the learning environments that they create, then it is important to understand that students with different needs are likely to prefer different environments. Also, Chapter 4 reports our exploration of whether gender differences exist in students’ perceptions of actual and preferred learning environments.

Second, in Chapter 4, we report an investigation of whether the creation of outcomes-focused and ICT-rich classroom learning environments is associated with more positive student attitudes (Attitude to Subject, Attitude to Computer Use and student Academic Efficacy) and higher achievement. Simple correlation and multiple regression analyses with two units of analysis (the student and the class mean) were used to estimate the strength of outcome-environment associations. Although the whole sample of 2317 students responded to the attitude measures, a subsample of only 386 students was available to provide achievement data. End-of-year school-based results for each subject were used as a measure of achievement.

Chapter 5 examines the viability of using feedback from the TROFLEI in teacher action research aimed at improving teaching practices. After teachers at Sevenoaks administered the learning environment instrument to their classes, the data were analysed to examine whether discrepancies exist between students’ perceptions of the actual learning environment and their preferred learning environment. Based on these results, the teachers engaged in action research involving introducing strategies in an attempt to reduce discrepancies between the actual and preferred environment over a 12-week intervention period. This chapter describes the efforts of three teachers who used feedback information in quite different ways in attempting to change the learning environment of their classrooms. The TROFLEI was readministered to the same classes at the end of the
intervention phase to gauge success in terms of improvements in classroom environment.

The concluding chapter (Chapter 6) summarises the whole book and draws out some of its implications. This chapter also considers our study’s limitations and makes some suggestions for future research.
CHAPTER 2

DEVELOPMENT OF INSTRUMENTS TO MONITOR OUTCOMES-FOCUSED LEARNING ENVIRONMENTS AND STUDENT ATTITUDES

INTRODUCTION

As discussed in the last chapter, the school administrators at Sevenoaks Senior College were committed to embracing outcomes-focused education. Therefore, it was important in our research to monitor teachers’ and students’ success in creating outcomes-focused learning environments in their classrooms. Consequently, a central aspect of the data-collection process involved the administration of a learning environment questionnaire. The data collected using this questionnaire were used to provide snapshots of the learning environment from the students’ perspective that could be used by teachers (to provide objective insights into the success of the strategies that teachers were using and to guide them in the improvement of their learning environments) and to school administrators (to provide information about the success of the strategies being used and to guide the types of professional development that teachers might require). Because of the potential value of the information collected from students, it was important to develop an appropriate instrument that would capture students’ perceptions of their learning environment and that could be used in helping to monitor the success of strategies aimed at creating an outcome-focused approach.

Our study also involved assessing students’ attitudes, monitoring changes in attitudes over time, and investigating associations between student attitudes and the classroom learning environment. Therefore we developed and validated a student attitude instrument with three scales.

This chapter describes the steps taken in the development and validation of each questionnaire. We first describe the development of the learning environment instrument (Technology-Rich Outcomes-Focused Learning Environment Inventory, TROFLEI), including the identification of suitable scales, adapting and adopting existing scales and field testing. A section is devoted to describing principles related to outcomes-focused educations and various dimensions of the learning environment that could be used to indicate whether the principles are being achieved. We explain how existing scales were selected and adapted for use in the new questionnaires and then describes the layout and response format of the TROFLEI. Finally, the reliability and validity of the TROFLEI are reported based on statistical analyses of data from a sample of 2317 students in 166 classes.

The next main section of this chapter is devoted to the development and validation of an instrument to assess student attitudes. We describe each of the three attitude scales and clarify what it assesses: Attitude to Subject (students’
CHAPTER 2

enjoyment of the subject), Attitude to Computer Use (students’ attitudes towards the use of computers) and Academic Efficacy (students’ beliefs about their academic competence). The layout and response format of the attitudes questionnaire are described. Finally, the reliability and validity of the attitude instrument are reported based on analyses of data from the same sample of 2317 students as for the validation of the learning environment instrument.

INSTRUMENT FOR ASSESSING OUTCOMES-FOCUSED LEARNING Environments

This section describes the development and validation of our widely-applicable and distinctive questionnaire (the TROFLEI) for assessing students’ perceptions of their classroom learning environments in outcomes-focused learning settings. The development of this questionnaire involved a number of steps. In the first place, a literature review helped to identify aspects of the learning environment that could be considered important in classrooms aiming to employ an outcomes focus. At this point, teachers and administrators were also involved in the selection of relevant scales. In the next step, suitable scales and items were adopted and adapted from already-existing and widely-used general classroom environment questionnaires, especially the What Is Happening In this Class? questionnaire (Aldridge & Fraser, 2000). During this step, the selection of different scales was also made to ensure coverage of Moos’ (1974) scheme for classifying the dimensions of any human environment. The instrument was then field tested with a large and heterogeneous sample of students. Finally, various statistical analyses were conducted with data from student responses (e.g., factor analysis and item analysis) to refine the scales and furnish validity and reliability information.

Identifying Important Aspects of the Learning Environment

As a first step, it was important to identify principles that could be considered important in a learning environment that enabled an outcomes focus, and then to delineate dimensions that could be used as a basis for developing specific scales that would give an indication of whether these principles were indeed being achieved.

Because an important principle related to outcomes-focused education is acknowledgement that students differ in terms of their abilities, rates of learning and interests (Griffin & Smith, 1997; Spady, 1993), teachers need to provide students with learning experiences that cater for the diversity of students in a classroom. With this in mind, we selected the Differentiation scale to assess the extent to which students perceive that teachers cater for students differently based on students’ capabilities and interests.

Another important principle is that students need to have goals, both short-term and long-term, to provide them with motivation and purpose (Killen, 2001; Spady, 1994). If these goals are clear and relevant, then students are more likely to be engaged in 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. To assess the extent to which students’ perceive that it is important to complete activities and understand the goals of the subject, the Task Orientation scale was selected.

Research has established that, if students are actively involved in learning activities, then it is likely that learning will be more meaningful to students. According to the Curriculum Council (2001, 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”. To examine the extent to which this is happening in the learning environment, the two important scales of Involvement and Investigation were selected.

The first of these scales, Involvement, examines 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. This scale assumes that language plays an important part in helping students to understand what they are learning (Taylor & Campbell-Williams, 1993). The selection of this scale assumes that giving students opportunities to participate in classroom discussions and to negotiate ideas and understandings with peers, rather than listening passively, are important aspects of the learning process.

The second of these scales, Investigation, examines the extent to which emphasis is placed on the skills and process of inquiry and their use in problem solving and investigation. This scale assumes that, in order for learning to be meaningful, teachers should create appropriate conditions to facilitate students’ active engagement in their learning (Spady, 1994). In this way, according to the Curriculum Council (2001), students have the opportunity to carry out relevant actions and to reflect upon these to help them to make sense of the results of those actions.

In developing this questionnaire, a situation in which teachers encourage a cooperative learning environment, rather than a competitive one, was considered to be desirable (Johnson, Johnson & Smith, 2007; Tan, Sharan & Lee, 2007). Whilst it is acknowledged that students should be given opportunities to work as individuals, it is equally important that they work together collaboratively. Such learning experiences should involve opportunities for students to cooperate with and learn from each other. It was with this in mind that the Cooperation scale was selected to assess the extent to which students cooperate with one another in a collaborative atmosphere.

It was considered important that the learning environment created by teachers is supportive to students, providing the intellectual, social and physical conditions for effective learning. Students are more likely to do well in their learning if they feel accepted and do not experience harassment and prejudice from either the teacher or their peers. Two scales were selected for assessing the extent to which students feel that their learning environment is conducive to learning, namely, Student Cohesiveness and Teacher Support.

The first of these scales, Student Cohesiveness, assesses the extent to which students know, help and are supportive of one another. To make sure that the environment is supportive of student learning, teachers need to create policies and
practices that help students to feel that they are accepted and supported by their peers (Curriculum Council, 2001). A supportive environment allows students to make mistakes without running the risk of being ridiculed. Social acceptance by peers and the need to have friends are important aspects that can affect students’ learning.

The second scale, Teacher Support, assesses the extent to which the teacher helps, befriends, trusts and is interested in students. 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, and to be inspired or turned away from learning. The supportiveness of a teacher helps to give students the courage and confidence needed to tackle new problems, take risks in their learning, and work on and complete challenging tasks. If students consider a teacher to be approachable and interested in them, then they are more likely to seek the teacher’s help if there is a problem with their work. The teacher’s relationship with his or her students, in many ways, is integral to a student’s success and to creating a cooperative learning environment (Hijzen, Boekaerts & Vedder, 2007). It was with this in mind that the Teacher Support scale was selected.

An outcomes-focused learning environment also requires the teacher to provide opportunities for all of the students in the class (Spady, 1994). The Equity scale assesses the extent to which students perceive that the teacher treats them in a way that encourages and includes them as much as their peers. This scale gives teachers an indication of whether students perceive that they are being treated fairly by the teacher.

Part of the school ethos at Sevenoaks Senior College is that students should be provided with an environment in which they are encouraged to be responsible for their own learning. At the school, this is known as a ‘young adult ethos’ and so a scale called Young Adult Ethos was developed to assess whether students feel that teachers give them responsibility and treat them as young adults.

Finally, the information and communications technology built into the infrastructure of Sevenoaks Senior College was available to all teachers. It was important to assess the extent to which teachers designed their lessons in a way that enabled students to make use of this technology (e.g., as a tool to communicate with others or to access information). The Computer Usage scale was therefore designed to assess the extent to which students perceive that they are given the opportunity to use computers in different ways (e.g., emails, discussion boards).

Although it is acknowledged that a questionnaire comprising 10 scales cannot assess every aspect of the learning environment, the selected scales are all considered to be especially relevant to outcomes-focused learning environments. Importantly, many of these scales have also been shown to be predictors of student outcomes in past research (e.g., Aldridge, Fraser & Huang, 1999).

For each of the 10 TROFLEI scales, Table 3 provides a scale definition, a sample item, and its relevance to the Curriculum Council’s (2001) teaching and learning principles.
Adopting and Adapting Suitable Scales

The What Is Happening In this Class? (WIHIC) questionnaire was drawn on especially during the development of the new instrument. The WIHIC was originally developed by Fraser, McRobbie and Fisher (1996) to include scales that had been shown to be predictors of student outcomes in past research and to combine these with new scales assessing dimensions of contemporary relevance. The personal form of the instrument was used to elicit the student’s perception of his/her individual role within the classroom, as opposed to the student’s perceptions of the class as a whole (Fraser, 1994, 1998a, 1998b; Fraser, Giddings & McRobbie, 1995; Fraser & McRobbie, 1995; Fraser, McRobbie & Fisher, 1996). The personal form is concordant with the constructivist theory of learning (Bruner, 1986; Tobin, 1993; von Glasersfeld, 1989). Based on the assumption that individuals construct their own meaning and knowledge of the world, rather than obtaining it from external sources, the personal form enables students to provide individual interpretations of their environment. As such, the personal form is well suited for assessing the perceptions of subgroups of students within a class.

The robust nature of the WIHIC made it a sensible choice as a starting point for the present study that involved a sample from a range of subjects. The reliability, validity and usefulness of the WIHIC have been widely reported in studies in different subject areas, at different age levels and in nine different countries. Since the initial development of the WIHIC, it has been used successfully to assess the learning environment in studies in Singapore (Fraser & Chionh, 2000; Khoo & Fraser, 2008), Australia and Taiwan (Aldridge & Fraser, 2000; Aldridge, Fraser, & Huang, 1999; Yang, Huang & Aldridge, 2002), Brunei (Khine & Fisher, 2001; Riah & Fraser, 1998), Canada (Raafflub & Fraser, 2002; Zandvliet & Fraser, 2004, 2005), Australia (Aldridge & Fraser, 2000; Dorman, 2001), Indonesia (Adolphe, Fraser & Aldridge, 2003; Margianti, Aldridge & Fraser, 2004), Korea (Kim, Fisher & Fraser, 2000), the United States (Allen & Fraser, 2007; Martin-Dunlop & Fraser, 2008; Moss & Fraser, 2001; Ogbuehi & Fraser, 2007; Wolf & Fraser, in press) and Canada, Britain and the United States (Dorman, 2003). Within these countries, the WIHIC has been used to assess a range of subjects including high school science (Aldridge & Fraser, 2000; Aldridge, Fraser & Huang, 1999; Moss & Fraser, 2001; Ria & Fraser, 1998), mathematics (Margianti, Aldridge & Fraser, 2004; Soerjaningsih, Fraser & Aldridge, 2001; Ogbuehi & Fraser, 2007), mathematics and science (Raafflub & Fraser, 2002) and mathematics and geography (Fraser & Chionh, 2000).

Using a sample of 3980 high school students from Australia, Britain and Canada, confirmatory factor analysis was used to support the seven-scale a priori structure of the WIHIC (Dorman, 2003). In this study, Dorman (2003) found that all items loaded strongly on their own scale, although model fit indices revealed a degree of scale overlap. The factor structure was found to be invariant for country, grade level and gender. Overall, the study strongly supported the international applicability of the WIHIC as a valid measure of the classroom psychosocial environment.
Table 3. Moos Category, Scale Description and Sample Item for Each TROFLEI Scale and its Relevance to the Principles of Outcomes-Focused Education

<table>
<thead>
<tr>
<th>Scale</th>
<th>Moos Category</th>
<th>Description</th>
<th>Sample Item</th>
<th>Relevance to Outcomes-Focused Approach According to Curriculum Council (2001)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Cohesiveness</td>
<td>R</td>
<td>Students know, help and are supportive of one another.</td>
<td>Students in this class like me.</td>
<td>The learning environment should provide a cooperative atmosphere in which students feel that they are supported by their peers.</td>
</tr>
<tr>
<td>Teacher Support</td>
<td>R</td>
<td>The teacher helps, befriends, trusts and is interested in students.</td>
<td>The teacher is interested in my problems.</td>
<td>To ensure that the atmosphere is conducive to effective learning, teachers should provide a supportive learning environment in which they foster a sense of trust and belonging.</td>
</tr>
<tr>
<td>Involvement</td>
<td>P</td>
<td>Students have attentive interest, participate in discussions, do additional work and enjoy the class.</td>
<td>I explain my ideas to other students.</td>
<td>Learning experiences should encourage students to be active participants in the learning process.</td>
</tr>
<tr>
<td>Investigation</td>
<td>P</td>
<td>Emphasis is placed on the skills and processes of inquiry and their use in problem solving and investigation.</td>
<td>I find out answers to questions by doing investigations.</td>
<td>Learning experiences should provide students with opportunities to engage fully with concepts that they are to develop.</td>
</tr>
<tr>
<td>Task Orientation</td>
<td>S</td>
<td>It is important to complete activities planned and to stay on the subject matter.</td>
<td>I know the goals for this class.</td>
<td>Purposeful learning can be enhanced by making clear the long-term outcomes expected to result from students’ engagement with the learning experiences provided.</td>
</tr>
<tr>
<td>Dimension</td>
<td>Response</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>----------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperation</td>
<td>R</td>
<td>Students cooperate rather than compete with one another on learning tasks. I work with other students on projects in this class. Learning experiences should provide students with opportunities to work collaboratively with others to and contribute in various ways.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>R</td>
<td>Students are treated equally by the teacher. The teacher gives as much attention to my questions as to other students’ questions. 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differentiation</td>
<td>S</td>
<td>Teachers cater for students differently on the basis of ability, rates of learning and interests. I work at my own speed. 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Usage</td>
<td>S</td>
<td>Students use their computers as a tool to communicate with others and to access information. I use the computer to obtain information from the Internet. Learning experiences should provide students with the opportunity to build motivation and confidence to develop and use a range of technological solutions to meet their needs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young Adult Ethos</td>
<td>P</td>
<td>Teachers give students responsibility and treat them as young adults. I am expected to think for myself. Classroom practices should encourage students to take responsibility for their own learning.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R: Relationship Dimension; P: Personal Development Dimension; S: System Maintenance and Change Dimension

The response alternatives for each TROFLEI item are Almost Never, Seldom, Sometimes, Often and Almost Always.
CHAPTER 2

All seven of the original WIHIC scales were included in the new instrument (namely, Student Cohesiveness, Teacher Support, Involvement, Investigation, Task Orientation, Cooperation and Equity). Three new scales of educational importance were developed for the purposes of this study. To capture the individualised nature of an outcomes-based program, a Differentiation scale was adapted from the Individualised Classroom Environment Questionnaire (ICEQ; Fraser, 1990). This scale assesses the extent to which the teacher provides opportunities for students to choose the topics on which they would like to work and to work at their own pace. Because technology-rich learning environments require students to use computers in a range of different ways, a Computer Usage scale was developed to provide information about the extent to which students use computers in various ways (e.g., email, access the internet, discussion forums). Finally, as discussed in the previous section, the Young Adult Ethos scale was developed to assess the extent to which teachers give their students responsibility for their own learning.

In past learning environment research, a parallel preferred version of a questionnaire has often been used in conjunction with the actual form (Fraser, 2007). Whilst the actual version of a questionnaire assesses students’ perceptions of the learning environment created, the preferred version is designed to allow teachers or researchers to examine how students would prefer the learning environment to be. In developing and using the TROFLEI, parallel preferred and actual forms were included.

Describing the TROFLEI

The TROFLEI contains 80 items with 8 items belonging to each of 10 scales. Table 3 provides for each scale its classification according to Moos’ (1974) scheme, a scale description and a sample item. Items are responded to on a five-point frequency scale with the alternatives of Almost Never, Seldom, Sometimes, Often and Almost Always. Appendix 1 provides a copy of the actual and preferred forms of the TROFLEI as used in the present study.

In Moos’s (1974) scheme for classifying human environments, the three basic types of dimensions are Relationship Dimensions (which identify the nature and intensity of personal relationships within the environment and assess the extent to which people are involved in the environment and support and help each other), Personal Development Dimensions (which assess basic directions along which personal growth and self-enhancement tend to occur) and System Maintenance and System Change Dimensions (which involve the extent to which the environment is orderly, clear in expectations, maintains control and is responsive to change). How Moos’s scheme can be used to classify the 10 dimensions of the TROFLEI is shown in Table 3.

Historically, negatively-worded items have been used to guard against passive responses and response bias. However, Barnette (2000) questions the utility of negatively-worded items, as they cannot be considered direct opposites of their positively-worded counterparts. In addition, studies have revealed that using positively-worded items improves response accuracy and internal consistency (Chamberlain & Cummings, 1984; Schreisheim, Eisenbach & Hill, 1991; Schriesheim & Hill, 1981).
We considered it appropriate, therefore, to use only items with a positive scoring direction in developing the TROFLEI.

To provide contextual cues and to minimise confusion to students, we considered it appropriate to group together in blocks all of the items that belong to the same scale instead of arranging them randomly or cyclically (Aldridge, Fraser, Taylor, & Chen, 2000). To give students confidence when completing the questionnaire, the scales were sequenced so that more familiar issues (such as Student Cohesiveness) were placed before less familiar issues (such as Involvement).

Historically, in studies in which both the actual and preferred classroom environment are assessed, researchers have administered separate actual and preferred versions of questionnaires. However, to provide a more economical format in our research, the TROFLEI pioneered the inclusion of two adjacent response scales on the one page (one to record what students perceived as actually happening in their class and the other to record what students would prefer to happen in their class). This side-by-side layout of the responses for actual and preferred forms of the TROFLEI is illustrated in Figure 1.

<table>
<thead>
<tr>
<th></th>
<th>ACTUAL</th>
<th>PREFERRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>50. I get the same amount of help from the teacher as do other students.</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

Figure 1. Illustration of Side-by-Side Response Format for Actual and Preferred TROFLEI Items

Validity and Reliability of the TROFLEI

The initial version of the TROFLEI, containing 80 items with 8 items in each of 10 scales, was extensively field tested to provide evidence of the instruments’ validity and reliability. Data collected from the 2317 students in 166 classes were analysed in various ways to investigate the validity and reliability of both the actual and preferred versions of the TROFLEI. The sample was drawn from across two Australian states (Western Australia and Tasmania) and involved Year 11 and 12 students enrolled in examination-oriented and wholly school-assessed classes. A more detailed description of the sample is provided in Chapter 1.

Separate exploratory factor analyses were conducted for the actual and preferred forms to check the 10-scale a priori structure of the instrument. Also multitrait-multimethod modelling, within a confirmatory factor analysis framework and with the 10 scales as traits and the two forms of the instrument (actual and preferred) as methods, was used to support the TROFLEI’s construct validity. These analyses are reported in the sections below.

Factor structure of TROFLEI. When the researcher’s 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 varimax rotation was used to extract a factor structure for the TROFLEI and to check it against the a priori 10-scale structure of the TROFLEI. A separate factor analysis was conducted for actual and preferred data. Prior to conducting the factor analysis, the assumptions which underlie the application of the principal axis factor analysis, including the proportion of sampling units to variables and the sample being selected on the basis of representation, were considered.

Factor analysis confirmed a slightly-refined structure for the actual and preferred forms of the TROFLEI comprising 77 items in the same 10 scales. 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 less than 0.40 on each of the other nine TROFLEI scales. Items 57, 58 and 61 from the Differentiation scales were omitted as they did not load 0.40 or above on their own or on any other scale. All of the remaining 77 TROFLEI items had a loading of at least 0.40 on their a priori scale and no other scale (see Table 4) for both the actual and preferred versions. The percentage of the total variance extracted with each factor is also recorded at the bottom of Table 4. For the actual version, the percentage of variance varied from 3.75% to 6.99% for different scales, with the total variance accounted for being 58.03%. For the preferred version, the percentage of variance ranged from 4.03% to 7.96% for different scales, with a total variance accounted for being 64.97%.

Internal consistency reliability, discriminant validity and ability to differentiate between classrooms for TROFLEI. For the refined 77-item version of the TROFLEI, three further indices of scale reliability and validity were generated separately for the actual and preferred versions. A convenient discriminant validity index (namely, the mean correlation of a scale with other scales) was used as evidence that each TROFLEI scale measures a separate dimension that is distinct from the other scales in this questionnaire. The Cronbach alpha reliability coefficient was used as an index of scale internal consistency. Analysis of variance (ANOVA) was used to check the ability of each scale in the TROFLEI’s actual form to differentiate between the perceptions of students in different classrooms.

In the development of a questionnaire, it is necessary to establish that each item in a scale assesses a common construct. If this is the case, then the scale is referred to as being ‘homogenous’ or having internal consistency. The internal consistency of each TROFLEI scale was established using Cronbach’s alpha coefficient for two units of analysis (the individual student and the class mean) and is reported separately for the actual and preferred versions in Table 5. Using the individual as the unit of analysis, scale reliability estimates ranged from 0.85 to 0.94 for the actual form and from 0.86 to 0.95 for the preferred form. Generally reliability figures were even higher with the class mean as the unit of analysis (ranging from 0.90 to 0.97 for the actual form and from 0.91 to 0.97 for the preferred form). These internal consistency indices are comparable to those in past studies that have used the WIHIC (Aldridge & Fraser, 2000; Fraser & Chionh, 2000; Wolf & Fraser, in press).
<table>
<thead>
<tr>
<th>Item No</th>
<th>Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Student Cohesiveness</td>
</tr>
<tr>
<td>1</td>
<td>0.70</td>
</tr>
<tr>
<td>2</td>
<td>0.60</td>
</tr>
<tr>
<td>3</td>
<td>0.57</td>
</tr>
<tr>
<td>4</td>
<td>0.75</td>
</tr>
<tr>
<td>5</td>
<td>0.57</td>
</tr>
<tr>
<td>6</td>
<td>0.47</td>
</tr>
<tr>
<td>7</td>
<td>0.67</td>
</tr>
<tr>
<td>8</td>
<td>0.47</td>
</tr>
<tr>
<td>9</td>
<td>0.70</td>
</tr>
<tr>
<td>10</td>
<td>0.77</td>
</tr>
<tr>
<td>11</td>
<td>0.71</td>
</tr>
<tr>
<td>12</td>
<td>0.58</td>
</tr>
<tr>
<td>13</td>
<td>0.67</td>
</tr>
<tr>
<td>14</td>
<td>0.71</td>
</tr>
<tr>
<td>15</td>
<td>0.66</td>
</tr>
<tr>
<td>16</td>
<td>0.61</td>
</tr>
<tr>
<td>17</td>
<td>0.73</td>
</tr>
<tr>
<td>18</td>
<td>0.76</td>
</tr>
<tr>
<td>19</td>
<td>0.51</td>
</tr>
<tr>
<td>20</td>
<td>0.62</td>
</tr>
<tr>
<td>21</td>
<td>0.46</td>
</tr>
<tr>
<td>22</td>
<td>0.61</td>
</tr>
<tr>
<td>23</td>
<td>0.49</td>
</tr>
<tr>
<td>24</td>
<td>0.50</td>
</tr>
</tbody>
</table>
Factor loadings smaller than 0.40 have been omitted.
Items 57, 58 and 61 were omitted.
The sample consisted of 2317 student responses in 166 classes.
Discriminant validity assesses the extent to which a scale is unique in the dimensions that it covers (i.e., the construct is not included in another scale of the instrument). The factor analysis provided support for the independence of factor scores and evidence relevant to the discriminant validity of factor scores on the TROFLEI. As a convenient index of the discriminant validity of raw scores on different scales, the mean magnitude of the correlation of one scale with other scales in the TROFLEI was calculated using two units of analysis.

Using the individual as the unit of analysis, the discriminant validity results (mean correlation of a scale with other scales) for the 10 scales of the TROFLEI ranged from 0.15 to 0.39 for the actual form and from 0.15 and 0.48 for the preferred form with the student as the unit of analysis. With the class mean as the unit of analysis, scale discriminant validity ranged from 0.20 to 0.48 for the actual form and from 0.19 to 0.52 for the preferred form. These results suggest that raw scores on the TROFLEI assess distinct but somewhat overlapping aspects of learning environment. However, the factor analysis supports the independence of factor scores on the 10 scales.

It was important to determine the degree to which the actual form of the TROFLEI is capable of differentiating between the perceptions of students in different classes. To do this, a one-way analysis of variance (ANOVA), with class membership as the independent variable \(N=166\), was computed for each TROFLEI scale. 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 ANOVA results reported in Table 5 show that all 10 TROFLEI 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) ranged from 0.07 to 0.22 for different TROFLEI scales.

The statistics obtained for the internal consistency (alpha reliability) and the ability of each scale to differentiate between the perceptions of the students in different classrooms (eta\(^2\) statistic from ANOVA) can be considered acceptable. The results presented in Table 5, in conjunction with the factor analysis results in Table 4, support the contention that the TROFLEI is a valid and reliable classroom environment instrument for the assessment of students’ perceptions of their psychosocial environments at the high school level.

Use of multitrait-multimethod modelling in validating the TROFLEI. Aldridge, Dorman and Fraser (2004) used multitrait-multimethod modelling for the first time in learning environments research with a subsample of the students from our study’s main sample as described in Chapter 1. The subsample consisted of 1,249 students, of whom 772 were from Western Australia and 477 were from Tasmania (compared with 2317 students in our entire sample). When the 10 TROFLEI scales were used as traits and the actual and preferred forms of the instrument as methods, the results supported the TROFLEI’s construct validity and sound psychometric properties, as well as indicating that the actual and preferred forms share a common structure.
DEVELOPMENT OF INSTRUMENTS TO MONITOR OUTCOMES-FOCUSED

Table 5. Internal Consistency Reliability (Cronbach Alpha Coefficient), Discriminant Validity (Mean Correlation With Other Scales) and Ability to Differentiate Between Classrooms (ANOVA Results) for Two Units of Analysis for the Modified TROFLEI Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Unit of Analysis</th>
<th>No of Items</th>
<th>Alpha Reliability</th>
<th>Mean Correlation with other Scales</th>
<th>ANOVA Eta²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Actual</td>
<td>Preferred</td>
<td>Actual</td>
</tr>
<tr>
<td><strong>Student Cohesiveness</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.87</td>
<td>0.90</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.92</td>
<td>0.94</td>
<td>0.37</td>
</tr>
<tr>
<td><strong>Teacher Support</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.92</td>
<td>0.92</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.96</td>
<td>0.96</td>
<td>0.42</td>
</tr>
<tr>
<td><strong>Involvement</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.90</td>
<td>0.92</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.91</td>
<td>0.93</td>
<td>0.48</td>
</tr>
<tr>
<td><strong>Task Orientation</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.88</td>
<td>0.94</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.90</td>
<td>0.97</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>Investigation</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.92</td>
<td>0.95</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.94</td>
<td>0.96</td>
<td>0.37</td>
</tr>
<tr>
<td><strong>Cooperation</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.91</td>
<td>0.93</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.94</td>
<td>0.96</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Equity</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.94</td>
<td>0.95</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.97</td>
<td>0.98</td>
<td>0.44</td>
</tr>
<tr>
<td><strong>Differentiation</strong></td>
<td>Individual</td>
<td>5</td>
<td>0.85</td>
<td>0.86</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.92</td>
<td>0.91</td>
<td>0.20</td>
</tr>
<tr>
<td><strong>Computer Usag</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.88</td>
<td>0.90</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.94</td>
<td>0.94</td>
<td>0.20</td>
</tr>
<tr>
<td><strong>Young Adult Ethos</strong></td>
<td>Individual</td>
<td>8</td>
<td>0.93</td>
<td>0.94</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.96</td>
<td>0.97</td>
<td>0.37</td>
</tr>
</tbody>
</table>

**p<0.01**
The sample consisted of 2317 students in 166 classes.
The eta² statistic (which is the ratio of ‘between’ to ‘total’ sums of squares) represents the proportion of variance explained by class membership.

INSTRUMENT FOR ASSESSING STUDENTS’ ATTITUDES

This section describes the development and validation of an instrument that we used to assess and monitor the attitudes of students in our study. Although an examination of past research indicated that the learning environment created by teachers is likely to influence students’ attitudes (Fraser, 1998a, 2007; Walker, 2006), attitude outcomes are often overlooked in preference to cognitive outcomes. The researchers and administrative staff at Sevenoaks were keen that student affective outcomes should play an important role in the study.
Developing an Instrument to Assess Student Attitudes

A review of literature and a needs assessment among the administrative staff at Sevenoaks were used as a starting point for the development of this attitude instrument. In our study, we focused on three distinct and important aspects of students’ attitudes: attitude towards their subject, attitude towards computer use and academic efficacy.

Attitude to Subject. In the past, the study of students’ affective outcomes has been the cause of definition problems, and terms associated with this domain, such as ‘interests’ or ‘attitudes’, often have been used loosely and without clarification (Peterson & Carlson, 1979). In 1964, Krathwohl, Bloom and Masia (1964) went some way towards solving this difficulty when they developed a taxonomy in which various affective behaviours were placed along a hierarchical continuum which clarified some of the terms previously used to describe affective behaviours. They identified five major levels of internalisation in the structure of the affective domain: receiving or attending; responding; valuing; organisation; and characterisation by a value or value complex. Klopfer (1971, 1976) took this taxonomy one step further and developed a four-category structure for the affective domain specifically related to science education: events in the natural world (awareness and an emotive response to experiences); activities (students’ participation in activities related to science, both informal and formal); science (the nature of science as a means of knowing about the world); and inquiry (scientific inquiry processes).

Students’ attitudes towards a subject have been measured using a variety of techniques, including: interviews; open-ended questions; projective techniques; closed-item questionnaires (such as Likert scales); and preference rankings (La forgia, 1988). A number of instruments have been designed to elicit students’ attitudes towards a subject (Fisher, 1973; Fraser, 1978, 1981; Mackay, 1971; Walker, 2006), but some of these instruments have been criticised on conceptual and empirical grounds (Gardner, 1975; Munby, 1980; Schibeci, 1984).

A review of literature revealed a large pool of attitude scales. Of particular interest to our study is the Test of Science Related Attitudes (TOSRA) developed by Fraser (1978, 1981) to measure students’ attitudes towards their science classes. Fraser based TOSRA’s subscales on Klopfer’s (1976) taxonomy of the affective domain related to science education. Because outcomes-focused education was being introduced in all subjects across the curriculum, we were interested in examining the way in which students might regard any given subject in terms of whether it is interesting, boring, dull or exciting. Therefore, for our study, we selected TOSRA’s Enjoyment of Science Lessons scale and modified it for obtaining student self reports about their enjoyment of a given subject.

Attitude to Computer Use. Sevenoaks was built with a unique ICT infrastructure that is aimed at facilitating an outcomes-focused curriculum. The integration of IT into the delivery of programs at the school provides online curriculum and electronic information management systems to teachers and students. Past studies have indicated that institutions that provide easy access to computers could foster
positive attitudes (Mitra & Steffensmeier, 2000; Teo, 2006) towards the use of computers. According to Liu, Macmillan and Timmons (1998), students who have positive attitudes towards computers are more likely to have positive attitudes towards using computers in their learning. It was considered important, therefore, that our study incorporated the assessment of students’ attitudes to computers in this technology-rich setting.

The scale used in our study was based on the Computer Attitudes Survey (CAS; Loyd and Gressard, 1984; Newhouse, 2001). The CAS was originally designed to evaluate students’ attitudes towards computers and computer programs. The original version, with 30 positively-worded and negatively-worded items, was found to be reliable and effective (Loyd & Gressard 1984). Newhouse (2001) later used this survey after modifying some of the items. Eight items were selected and adapted to form the Attitude to Computer Use scale in the present study. This new scale combines items from each of the versions of the CAS, consists only of positively-worded items and assesses students’ enjoyment or anxiety associated with using computers.

Academic Efficacy. Self-efficacy represents a core aspect of Bandura’s (1997) social-cognitive theory. Self-efficacy beliefs are concerned with the judgements that people make about what they can do with their skills, rather than the skills themselves, and refer to the extent to which an individual is confident in his or her ability (Bandura, 1986). Because self-efficacy differs from other expectancy constructs in as much as it is goal specific, high self-efficacy in one setting does not guarantee high self-efficacy in another (Bandura, 1986, 1989; Pintrich & Schunk, 1995).

The scale that was used in our study was adapted from the Morgan-Jinks Student Efficacy Scale (MJSES; Jinks & Morgan, 1999). A student’s sense of self-efficacy can influence several aspects of behaviour that are important to learning. Past research has revealed that high self-efficacy positively affects engagement, effort, persistence, goal setting and performance (Bandura, 1982, 1989; Schunk, 1989; Zimmerman, Bandura, & Martinez-Pons, 1992). That is, increased self-efficacy often results in an increase in willingness to engage and persist in challenging tasks (Pajares, 1996). Furthermore, higher self-efficacy directly influences academic performance by increasing the quality of information processing as well as its quantity. Reviews of research indicate that high-efficacy students are more likely to use a broader array of strategies, use them more flexibly and process information at a deeper level (Pajares, 1996; Schunk, 1989).

One premise of this study was that student self-efficacy beliefs regarding competence could have important implications for improving learning environments and, therefore, student outcomes (Lorsbach & Jinks, 1999). Our study investigated students’ beliefs about their academic competence and whether associations exist between students’ perceptions of their competence and their perceptions of the learning environment.
CHAPTER 2

Describing the Attitude Instrument

The attitude instrument developed for our study consists of 18 items in three scales, namely, Attitude to Subject, Attitude to Computer Use and Academic Efficacy. Students respond to each item in the instrument by indicating how often they consider the statement to be true. In order to make it easier for students when responding, the attitude items had the same five frequency response alternatives (ranging from Almost Never to Almost Always) as TROFLEI items. A copy of the three attitude scales can be found in Appendix 2.

Validity and Reliability of Student Attitude and Academic Efficacy Scales

Our instrument for assessing Attitude to Subject, Attitude to Computer Use and Academic Efficacy initially contained 24 items, with 8 eight items in each of three scales, but this was modified slightly after the statistical analyses described below.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Attitude to Subject</th>
<th>Attitude to Computer Use</th>
<th>Academic Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.55</td>
<td></td>
<td>0.48</td>
</tr>
<tr>
<td>3</td>
<td>0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.53</td>
<td></td>
<td>0.49</td>
</tr>
<tr>
<td>7</td>
<td>0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>11</td>
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<td>0.41</td>
<td></td>
</tr>
<tr>
<td>12</td>
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<td>0.80</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>0.66</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>0.83</td>
<td></td>
</tr>
<tr>
<td>17</td>
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<td></td>
<td>0.79</td>
</tr>
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<tr>
<td>20</td>
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<tr>
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<tr>
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<tr>
<td>24</td>
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<td>0.64</td>
</tr>
</tbody>
</table>

% Variance 16.10 19.45 25.46

Factor loadings smaller than 0.40 have been omitted.
The sample consisted of 2317 students in 166 classes.
Items 2, 5, 8, 14, 15 and 22 were omitted.
The attitude scales were administered to the same sample of 2317 students in 166 classes as for the TRFOLEI. Attitude data for this sample were subjected to principal components factor analysis followed by varimax rotation. This resulted in the acceptance of a revised version of the instrument with the same three \textit{a priori} factors, but with six items omitted, namely, Items 2, 5 and 8 from the Attitude to Subject scale, Item 14 and 15 from the Attitude to Computer Use scale and Item 22 from the Academic Efficacy scale. The factor analysis results are reported in Table 6. As for the factor analysis for the TROFLEI, the retention of any attitude item depended on it having a factor loading of at least 0.40 with its own scale and less than 0.40 on each of the other scales. For the final version, all items loaded more than 0.40 on their own scale and no other scale with the exceptions of Items 1 and 6 from the Attitude to Subject scale, which also loaded on the Academic Efficacy scale (see the factor loadings reported in Table 6). The percentage of variance ranged from 16.10% to 25.46% for different attitude scales, with the total variance accounted for being 61.01%.

The internal consistency reliability (Cronbach alpha coefficient) of each of the three attitude and efficacy scales for two units of analysis (individual and class mean) is reported in Table 7. Scale reliability estimates ranged from 0.81 to 0.88 using the individual as the unit of analysis and from 0.78 to 0.92 using the class mean as the unit of analysis. As a convenient index of the discriminant validity of the attitude questionnaire, use was made of the mean correlation of a scale with the other scales for the three scales of the attitude instrument. The mean correlation of a scale with other scales ranged from 0.13 to 0.21 using the individual as the unit of analysis and from 0.09 to 0.16 using the class mean as the unit of analysis (see Table 7), suggesting sound discriminant validity. The results in Tables 4 and 5 suggest reasonable factorial validity, internal consistency reliability and discriminant validity for the three attitude and efficacy scales.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Unit of Analysis</th>
<th>No of Items</th>
<th>Alpha Reliability</th>
<th>Mean Correlation with other Scales</th>
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<tr>
<td>Attitude to Subject</td>
<td>Individual</td>
<td>5</td>
<td>0.81</td>
<td>0.18</td>
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<td></td>
<td>Class Mean</td>
<td></td>
<td>0.92</td>
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<tr>
<td>Attitude to Computer Use</td>
<td>Individual</td>
<td>6</td>
<td>0.83</td>
<td>0.13</td>
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<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.78</td>
<td>0.16</td>
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<td>Academic Efficacy</td>
<td>Individual</td>
<td>7</td>
<td>0.88</td>
<td>0.21</td>
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<tr>
<td></td>
<td>Class Mean</td>
<td></td>
<td>0.82</td>
<td>0.09</td>
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</table>

The sample consisted of 2317 students in 166 classes.
CHAPTER 2

SUMMARY

A primary aim of our research was the development and validation of a questionnaire that could be used to monitor the implementation of outcomes-focused learning environments from the students’ perspective. The Technology-Rich Outcomes-Focused Learning Environment Inventory (TROFLEI) measures 10 dimensions of the actual and preferred classroom environments, namely, Student Cohesiveness, Teacher Support, Involvement, Investigation, Task Orientation, Cooperation, Equity, Differentiation, Computer Usage and Young Adult Ethos. Incorporated into the new questionnaire is a side-by-side response format which enables students to record their views of their actual and preferred learning environment.

To establish the reliability and validity of the TROFLEI, a sample of 2317 student responses from 166 classes in 10 senior colleges in Western Australia and Tasmania was used. A series of item and factor analyses led to a refined 77-item version of the TROFLEI. For both the actual and preferred versions of the questionnaire, all items had a factor loading of at least 0.40 on their a priori scale and no other scale. The total percentage of variance accounted for was 58.03% for the actual version and 64.97% for the preferred version.

For the actual and preferred versions of the TROFLEI, the internal consistency reliability and discriminant validity were both found to be satisfactory at the class mean and individual levels of analysis. Scale reliability estimates with the individual as the unit of analysis ranged from 0.85 to 0.94 for the actual form and from 0.86 to 0.95 for the preferred form. Further analyses supported the ability of the actual form of all 10 TROFLEI scales to differentiate between classrooms. These results support the reliability and validity of the TROFLEI at the high-school level across a number of different school subjects and learning areas.

In addition to the TROFLEI, three attitude scales (each with eight items) were developed to assess the affective outcomes of Attitude to Subject, Attitude to Computer Use and Academic Efficacy. For students’ ease of answering, the attitude scales used the same response alternatives as the TROFLEI. A series of item and factor analysis led to a 22-item instrument with all items loading more than 0.40 on their own scale and no other scale (with the exception that two items loaded on their own scale as well as one other scale). The total variance accounted for by the three attitude scales was 61.01%. The internal consistency reliability of different attitude scales ranged from 0.81 to 0.88 with the individual as the unit of analysis and from 0.78 to 0.92 with the class mean as the unit of analysis. The discriminant validity, at the individual and class mean levels of analysis, was considered satisfactory.

Whereas Chapter 2 described the development and validation of widely-applicable and distinctive questionnaires (for assessing students’ perceptions of their actual and preferred learning environment in outcomes-focused technology-rich classroom settings and three affective outcomes), the chapters that follow describe some uses for these questionnaire and demonstrate their potential for providing information to administrative staff and teachers about the implementation of outcomes-focused learning environments.