Science and Mathematics Education Centre

A Comparative Study of Gifted and Non-Gifted Middle-School Students in Terms of Classroom Environment and Attitudes Within a Large Urban School District

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DECLARATION

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

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

Signature: _____ Date: 21 June, 2013

Justin A. Koren

ABSTRACT

The majority of past research related to gifted education has focused on teachers' perspectives of gifted curriculum and instruction. Thus, much can still be gained by investigating the experiences of students in terms of their learning environments and attitudes. Few past studies have focused on gifted students' perspectives in the classroom and even fewer have compared the perceptions of gifted and non-gifted learners.

This study employed the What Is Happening In this Class? (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) questionnaires to investigate differences between gifted and non-gifted middle-school students' perceptions of classroom learning environment and attitudes. The sample consisted of 495 middle-school students (238 gifted students and 257 non-gifted students) in Grades 6, 7, and 8 in 31 classes from 10 different schools. All students were enrolled in advanced-level classes and assigned to heterogeneous classrooms comprised of both gifted and non-gifted students. Selected schools had student populations with similar racial and socioeconomic status demographics and all schools designated were 'Title I' by the Florida Department of Education's Bureau of Federal Educational Programs.

The data gathered from the 495 students were statistically analyzed using principal axis factor analysis with varimax rotation and Kaiser normalization to check the *a priori* structure of the questionnaires. Only items with factor loadings that were larger than 0.40 on their own scale and less than 0.40 on the other scales were retained. Data analyses supported the WIHIC and SALES questionnaires' factorial validity, internal consistency reliability, and ability to differentiate between classrooms when assessing perceptions of the classroom learning environment and student attitudes.

A two-way MANOVA was performed to test giftedness, sex, and the giftedness–by–sex interactions as predictors of scores on the six learning environment scales from the WIHIC and the four attitudinal scales from the SALES. Because the multivariate tests using Wilks' lambda criterion yielded significant results for the set of dependent variables as a whole, the two-way ANOVA was interpreted separately for each dependent variable. Although differences between gifted and non-gifted students

were small and statistically non-significant for the majority of learning environment and attitudinal scales, significant but small differences emerged for the learning environment scale of Involvement (effect size of -0.18 standard deviations) and the attitudinal scale of Self-Regulation (effect size of 0.23 standard deviations). For the learning environment scale of Cooperation, both the sex effect and the giftedness–by–sex interaction were statistically significant. Cooperation scores for non-gifted females were noticeably higher than Cooperation scores for non-gifted males. Conversely, Cooperation scores for gifted females were marginally lower than Cooperation scores for gifted males.

When associations between the learning environment and student attitudes were investigated through correlational analyses, each of the six learning environment scales of the WIHIC was related positively and significantly with each of the four attitudinal scales of the SALES. Also, the multiple correlation between the six learning environment scales of the WIHIC and each attitudinal scale was statistically significant with either the student or the class mean as the unit of analysis. Furthermore, all statistically significant simple correlation and regression coefficients were positive, suggesting a positive link between learning environments and student attitudes. In particular, Task Orientation was the strongest independent predictor of all four attitudinal scales.

DEDICATION

The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore, all progress depends on the unreasonable man.

–George Bernard Shaw

To the idealistic premise that all students can learn if given a teacher who is willing to find the way in which to teach them.

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RATIONALE AND BACKGROUND

Educational evangelism may be all right in its place but it is a poor substitute for science in the search for truth.

–Lewis Terman

1.1 Introduction

Research evidence overwhelmingly supports the premise that educators should respond to gifted learners with opportunities for challenge and growth (Benbow & Lubinski, 1996; Colangelo & Davis, 2003; Lubinski & Benbow, 2000; VanTassel-Baska, 1998). The Templeton National Report on Acceleration (Colangelo, Assouline, & Gross, 2004) found that, for optimal intervention of gifted students, both personal attributes and environmental attributes need to be aligned. A review of the literature, however, reveals that the majority of past research has focused on teachers' perspectives of gifted curriculum and instruction. Consequently, much can still be learned from evaluating the experiences of students in terms of their learning environments and attitudes. Few studies have focused on gifted students' perspectives in the classroom and even fewer have compared the perceptions of gifted and non-gifted learners. Fraser (2012) asserts that "because teachers and students have systematically different perceptions of the same classrooms, student feedback about classrooms should be collected" (p. 1231).

Fraser (1998a) reported that there is a link between a favorable learning environment and positive student attitudes. Therefore, I decided to utilize the What Is Happening In this Class? (WIHIC) questionnaire and the Students' Adaptive Learning Engagement in Science (SALES) questionnaire to examine differences between gifted and non-gifted middle-school students in terms of perceptions of classroom learning environment and attitudes. Additionally, this study investigated associations between students' perceptions of their classroom learning environment and their attitudes. Differences between sexes in perceptions of classroom environment and attitudes, as

well as giftedness–by–sex interactions, were also investigated. This study is unique in that it delved into territory previously overlooked by researchers.

The purpose of this chapter is to provide background information about the present study and outline its context, theoretical framework, research objectives, and significance. Section 1.2 describes the setting of Miami-Dade County, Florida, where this study took place. Section 1.3 presents the theoretical framework relevant to the study. Section 1.4 presents the specific research objectives. Section 1.5 addresses the scholarly and practical significance of the study. Lastly, Section 1.6 provides an overview of the organization of the remaining chapters comprising this thesis.

1.2 Setting of the Study

This section provides background information relevant to the present study, including an overview of Miami-Dade County, Florida (Section 1.2.1) and an overview of Miami-Dade County Public Schools (Section 1.2.2).

1.2.1 Overview of Miami-Dade County, Florida

Miami-Dade County is located in the southeastern part of the State of Florida. According to the 2010 United States Census, the county had a population of 2,496,435, making it the most populous county in Florida and the eighth-most populous county in the United States. Within the county are 35 incorporated cities and municipalities, as well as many unincorporated areas. The northern, central, and eastern parts of the county are densely populated and heavily urbanized. Although television and cinema often portray Miami as a city filled exclusively with lavish high-rise buildings along the coastline, this is certainly not the case. Southern Miami-Dade County, one of the primary locations of this research study, includes the Redland and Homestead areas, which make up the agricultural economy of Miami. The Redland spans nearly one-third of Miami-Dade County's inhabited land area and is sparsely populated. The western portion of the county extends into Everglades National Park and is populated by the native Miccosukee Indian Tribe.

1.2.2 Overview of Miami-Dade County Public Schools

Founded in 1885, Miami-Dade County Public Schools, the school district in which this study was conducted, is currently the largest school district in the Southeastern United States and the fourth largest school district in the United States. Spanning more than 2,000 square miles, the school district is managed by the School Board of Miami-Dade County and is comprised of nine regionally elected board members. As the governing body of the school district, the Board is responsible for appointing a Superintendent to oversee its administrative affairs.

As of May 2013, the school district is divided into six regions with a total enrollment of 346,119 students attending 392 schools. The ethnic make-up of the school district is: 66.8% Hispanic; 23.4% Black; 8% White Non-Hispanic; 1.2% Asian; 0.1% American (Native) Indian; and 0.5% Other.[1] 51.2% of the school district's student population is male and 48.8% female (Assessment, Research, and Data Analysis, 2013).

In the last decade, Miami-Dade County Public Schools has experienced a remarkable increase in its gifted population. The number of students has increased by more than 50% since 2003. More than 10% of the district's students are currently labeled 'gifted', nearly double the State of Florida's average (Smiley, 2013).

1.3 Theoretical Framework

This section provides background information relevant to the present study, including a brief introduction to the field of gifted education (Section 1.3.1) and the field of learning environments (Section 1.3.2).

1.3.1. Background to the Field of Gifted Education

Brain research has revealed that learning takes place when students' abilities and interests are stimulated by the appropriate level of challenge (Caine & Caine, 1991;

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[1] The category 'Other' is an option made available to respondents completing government forms and other school district documents. This option was available to respondents who felt that the predetermined groups did not reflect their racial and/or ethnic origins.

Howard, 1994; Jensen, 1998; Sousa, 2001; Wolfe, 2001). Sternberg (1990) believed that the learning environment for gifted children should respond to their unique characteristics and encourage them to express the elements of critical and creative thought.

In the Classroom Practices Survey (Archambault, Westberg, Brown, Hallmark, Emmons, & Zhang, 1993), for which researchers gathered data from a sample of 7,300 educators, teachers reported making only minor modifications, if any, for gifted students in their classrooms. In the Classroom Practices Observation Study (Westberg, Archambault, Dobyns, & Slavin, 1993), researchers found that, in 84% of classroom activities, gifted students received no instructional or curricular differentiation of any kind.

In spite of the available strategies, the research suggests that teachers find it difficult to meet the needs of gifted learners. Teachers do not always receive the appropriate training in how to differentiate instruction, causing them to often rely on familiar methods rather than choosing strategies based on the specific needs of gifted students in their classes (Starko & Schack, 1989).

While the majority of comparative research on the subject of gifted and non-gifted students has focused on learning styles, self-concept, social relations and support, acceleration, and underachievement, past research has seemingly neglected gifted students' perspectives in relation to learning environments. Hence, this study is distinctive.

A comprehensive review of literature for the field of gifted education can be found in Chapter 2, Section 2.2.

1.3.2 Background to the Field of Learning Environments

Seventy-seven years ago, Lewin (1936), a German-American psychologist, developed the initial formal studies applicable to the field of learning environments. His field theory acknowledged that the environment and its interaction with individuals' personal characteristics are strong determinants of human behavior. Lewin contended

that one's behavior must be determined for every kind of psychological event, including one's actions, emotions, and expressions, for the momentary structure and the state of the person, and for the psychological environment. Lewin's formula, $B = f(P, E)$, depicts the environment as a determinant of human behavior. Behavior (B) is a function (f) of the person (P) and his or her environment (E). Lewin has come to be known as the 'founder of modern social psychology' because of his pioneering work in utilizing scientific methods and experimentation to study social behavior (Marrow, 1977).

Murray (1938), a humanist psychologist who referred to himself as a *personalogist*—one who describes, explains, and predict human behavior on the basis of conceptual systems known as personality theories (Hall & Lindzey, 1979)—was also attracted to the internal determinants of behavior. He believed that Lewin had overlooked developing a theory of drive or need, as Lewin had been solely interested in the external determinants of behavior. Murray's *needs-press* model corrected the omission by including the situational variables which are found in the environment and which account for a degree of behavioral difference. Moreover, Murray made a distinction between *alpha press* (the environment as observed by an external observer) and *beta press* (the environment as perceived by people themselves).

Murray's notions regarding beta press were further differentiated by Stern, Stein, and Bloom (1956) as either *private beta press* (an individual's view of his or her environment) or *consensual beta press* (the collective view of a group as a whole). Ultimately, it was determined that students' perceptions of a wide range of instructional and social cues relevant to their own learning can be formed within the time of a classroom lesson (Walberg & Anderson, 1972).

The Learning Environment Inventory was developed by Walberg (1968) as part of the research and evaluation activities of Harvard University's Harvard Project Physics, a national curriculum development project for secondary school physics (Walberg & Anderson, 1968). At the same time, at Stanford University, Moos began developing the first of his social climate scales, eventually resulting in the development of the Classroom Environment Scale (Moos & Trickett, 1974; Trickett & Moos, 1973).

The pioneering work of Walberg and Moos on perceptions of classroom environment has developed into major research programs and spawned a great deal of research that is reported in historically significant books (Fraser, 1986; Fraser & Walberg, 1991; Moos, 1979; Walberg, 1979), more recent books (Fisher & Khine, 2006; Goh & Khine, 2002; Khine & Fisher, 2003), and literature reviews (Fraser 1994, 1998a, 2007, 2012).

Furthermore, as a result of the work of Walberg and Moos, classroom learning environment research has grown to include development of other learning environment instruments (Fraser, 1998a, 2012; Goh & Khine, 2002; Spinner & Fraser, 2005; Wubbels & Levy, 1993). Additionally, the American Educational Research Association's Special Interest Group (SIG) on Learning Environments was created in the mid-1980s to permit researchers to present and publish research results in the field. Since 1998, the SIG sponsors *Learning Environments Research: An International Journal* published by Springer Publishers.

A comprehensive review of literature as it relates to the field of learning environments is presented in Chapter 2, Section 2.3.

1.4 Instruments Used in the Study

In this study, I assessed the learning environments of gifted and non-gifted classrooms with the WIHIC questionnaire and students' attitudes with the SALES questionnaire. These questionnaire surveys were selected because they have proven to be highly valid and efficient for data collection with a large number of respondents and because they lend themselves to quantitative analysis.

1.4.1 What Is Happening In this Class? (WIHIC)

The WIHIC questionnaire, developed by Fraser, Fisher, and McRobbie (1996), combines established environmental scales with new scales that address contemporary educational concerns (e.g. equity and constructivism) and thereby brings parsimony to the field of learning environments. The WIHIC incorporates a wide range of dimensions from an array of questionnaires that are significant to the present

condition in classrooms and that have also shown to be important predictors of student outcomes (Kim, Fisher, & Fraser, 2000).

This instrument was selected because it focuses on learning environment dimensions as perceived by students, rather than through the eyes of educators. The questionnaire requires little time to complete and questions are clear and concise, making it an appropriate instrument to use with middle-school students whose attention spans are typically shorter than those of adults. Fraser (2012) reported that the WIHIC currently is the most-frequently used classroom instrument around the world, having been validated successfully in myriad research studies.

1.4.2 Students' Adaptive Learning Engagement in Science (SALES)

Student attitudes were evaluated using the SALES questionnaire, developed by Velayutham, Aldridge, and Fraser (2011), to economically assess the factors that contribute towards students' adaptive motivated and self-regulated learning engagement in science. The questionnaire is intended to provide teachers with a reliable, valid, and convenient tool for gathering information about the motivation and self-regulation of science students. This information, in turn, is likely to guide classroom teachers in directing and focusing their teaching practices.

1.5 Specific Research Objectives

The study was intended to investigate:

- whether the revised What Is Happening In this Class? (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) questionnaires are valid and reliable for assessing classroom learning environments and attitudes, respectively, when used with middle-school students within the large urban school district of Miami-Dade County, Florida;
- whether students' perceptions of their classroom learning environment and attitudes vary with giftedness, sex, and/or the interaction of giftedness and sex; and
- whether associations exist between the classroom learning environment and student attitudes.

1.6 Significance of the Study

In 2004, a United States national report titled *A Nation Deceived: How Schools Hold Back America's Brightest Students* was published by the Institute for Research and Policy on Acceleration. Based on 50 years of research, the report called for a review of the current approach to gifted education in the United States (Colangelo et al., 2004).

Despite the broad range of literature available on the subject of meeting the needs of gifted students in the classroom, there remain gaps in the research. Experts in the field of gifted education propose practices that they use and know to be effective, but only a modest amount of research has formally tested their experience and recommendations. Although the majority of research conducted has focused on teachers' perspectives as they pertain to the implementation of gifted curriculum and the execution of instruction, much can still be gained from evaluating the experiences of students. Few past studies have focused on gifted students' perspectives in the classroom and even fewer have compared the perceptions of gifted and non-gifted learners. This study examined the effectiveness of gifted programs through the eyes of education's most important stakeholders—students.

As a teacher of middle-school gifted and non-gifted students, I consider that a comparative inquiry into the classroom environments and attitudes of both gifted and non-gifted middle-school students is significant to my professional activities and worthy of educational research. Research has confirmed that the classroom culture has a considerable influence on the quality of student learning experiences (den Brok, Fisher, Rickards, & Bull, 2006; Fraser, 1998b). Therefore, the present study was undertaken in order to provide educators with tangible evidence about the variance in learning environments and student attitudes among middle-school students in Miami-Dade County, Florida. This study was also undertaken to determine if the needs of the school district's middle-school gifted population are adequately being met.

Because of the size and diversity of Miami-Dade County Public Schools, the school district is often in the national spotlight. The district has been named a finalist for the Broad Prize for Urban Education—an annual award that honors urban school districts

across the United States that are making the greatest progress in raising student achievement in 2006, 2007, 2008, and 2011—and was awarded the accolade in 2012. Thus, conducting a study in this school district was appropriate and meaningful because the results could have significant implications not only for Miami-Dade County's educational institution, but also for the national educational community at large.

1.7 Overview of Thesis Chapters

This thesis is comprised of five chapters. Chapter 1 presented background information about the context in which the study was conducted and explained its theoretical foundations. The chapter also discussed the significance of the present study, outlined research objectives, and provided an overview of the organization of the thesis.

Chapter 2 provides a review of literature relevant to the present study. The chapter commences with an overview of gifted education, exploring instructional service delivery models and gender differences among gifted populations. Next, the chapter explores the history and evolution of the field of learning environments. The historical background of learning environments research and a range of learning environments questionnaires are reviewed, with the WIHIC questionnaire examined at length. The chapter concludes with a review of literature on the field of attitudes, emphasizing the significant constructs of motivation and self-regulation.

Chapter 3 addresses the methodology and instrumentation of the present study. This chapter provides details of procedural characteristics, including the pilot study, the sample of participants and its selection, administration of questionnaires, data collection, and data storage. Ethical considerations relevant to the present study are discussed. The statistical procedures employed in data analysis to answer research questions are also discussed in this chapter.

Chapter 4 reports analyses and results for each research question. Specifically, this chapter reports the statistical inferences drawn from the data related to the validity and reliability of the WIHIC and SALES questionnaires. This chapter also reports

results that were found for the investigation into whether students' perceptions of their classroom learning environment and attitudes varied with giftedness, sex, and/or the interaction of giftedness and sex. Lastly, the findings of the investigation into whether associations exist between the learning environment and student attitudes are presented.

Chapter 5 concludes this thesis with a final overview and presents summative opinions. This chapter reviews and delineates the significance of conducting the present study. Limitations of this study are noted. Additionally, practical implications of the findings from this study and suggestions for further research are proffered in this chapter.

Chapter 2

LITERATURE REVIEW

What is past is prologue.

–William Shakespeare

2.1 Introduction

This chapter reviews the literature of three significant fields relevant to this study: gifted education, learning environments, and student attitudes. Section 2.2 focuses on the field of gifted education. Section 2.3 focuses on the history of the field of learning environments. Section 2.4 reviews the range of questionnaires available to assess learning environments, together with their conceptualization, development, validation, and use. Section 2.5 addresses the various types of research that have been conducted in the field of classroom learning environments. Section 2.6 reviews the conceptualization and development of the WIHIC questionnaire used to assess learning environments in classrooms in my study. This section also describes the instrument's assessment scales, reviews past studies that have used the WIHIC, and affirms the questionnaire's cross-cultural validity. Section 2.7 provides a general overview of the field of student attitudes, placing particular focus on students' motivation and self-regulation because of their relevance to my study. Section 2.8 reviews the literature on gender differences among gifted and non-gifted students, as well as gender differences pertaining to the field of learning environments. Lastly, Section 2.9 provides a summary of this literature review.

2.2 Gifted Education

The purpose of this section is to review literature relevant to this study as it relates to gifted education, including the history of the field of the human intelligence testing (Section 2.2.1); history of the field of gifted education (Section 2.2.2); curriculum and instruction for gifted students (Section 2.2.3); a comparison of gifted versus non-gifted philosophies and approaches for middle schooling (Section 2.2.4); and an overview of the current state of gifted education in the United States (Section 2.2.5).

2.2.1 History of the Field of Human Intelligence Testing

Sternberg (2003) contends that psychologists have long debated the question of how to conceptualize and measure intelligence. The publication of *Hereditary Genius: An Inquiry into Its Law and Consequences* by Galton (1869) was the first social scientific attempt to study intellectual superiority (Gallagher, 1994; Tannenbaum, 1983). Galton's book, regarded as the first study of human ability, essentially concluded that heredity is the determining factor in intelligence. He later authored *Inquiries into Human Faculty and Its Development* (1883), an incongruent series of essays that highlighted individual differences in mental faculties.

Galton initiated the first mental testing and established the first psychology laboratory in the United States in 1890. He investigated mental ability and found that such investigations could be conducted in an experimental and practical fashion. Galton's (1908) findings sparked the establishment of the eugenics movement, which called for systems for improving the biological composition of the human species through 'selective parenthood' (Jensen, 2002; Simonton, 2003). Although the tests were deemed unsuccessful, Galton's work helped to pave the way for future testing (Jolly & Kettler, 2008). Galton's work has been regarded as the beginning of the mental test movement (Boring, 1950) and he has come to be known as the 'father of mental testing' (Boring, 1950; Goodenough, 1949). Cattell (1890) expanded upon Galton's studies by introducing the term *mental test* in his famous paper entitled Mental Tests and Measurements. Cattell believed it was fundamentally impossible to separate bodily energy from mental energy (Fancher, 1985).

In 1896, French psychologists Binet and Henri published a review of German and American work on the topic of individual differences. The review articulated that intelligence could be better measured by means of higher psychological processes. In the early 1900s, Binet and Simon began working to develop a measure that would differentiate students' expected learning abilities. The intention of their studies was to aid teachers in educating both students who learned concepts quickly, as well as those who learned at a slower pace. Binet and Simon are credited with developing the first intelligence test, which consisted of an assortment of questions that included naming objects, defining words, drawing pictures, completing sentences, comparing items, and constructing sentences.

French psychologists Binet and Simon (1905) developed the 30-item Binet–Simon Intelligence Test to measure mainly higher mental functions and to identify schoolchildren who would not benefit from regular classroom instruction. In 1908, Binet and Simon revised the test to include a 58-item scale that incorporated the concept of mental level. They revised the test a third time in 1911, providing each age level with five tests and extending the test to include adults. Although the Binet–Simon test was initially used to identify various degrees of mental retardation (Wolf, 1973), it ultimately became the first practical intelligence scale used to identify differences within school settings (Robins, 2010; Siegler, 1992).

The Binet–Simon test was translated into English by Goddard (1908), who was convinced of the test's effectiveness (Fancher, 1985; Zenderland, 1998). By 1911, Goddard had introduced the test in various public schools within the United States. He is credited with promoting psychological science and creating the intelligence testing industry in the United States (Benjamin, 2009).

Terman (1916), of Stanford University, authored *The Measurement of Intelligence: An Explanation of and a Complete Guide for the Use of the Stanford Revision and Extension of the Binet–Simon Intelligence Scale.* He modified the Binet–Simon tests for an American population, developing the Stanford–Binet Intelligence Test, which is considered the forerunner of all standardized IQ tests (Colangelo & Davis, 2003; Davis & Rimm, 1998; Delisle, 1999). The test, widely referred to as the 'Stanford–Binet', coined the concept *mental quotient*.

German psychologist Stern (1912) suggested dividing a person's mental age by his or her chronological age in order to obtain an *intelligence quotient*, commonly referred to as 'IQ' (Sattler, 1992). Gifted students were defined as those with an IQ above 140, which was considered to be in the highest intellectual range (Colangelo & Davis, 2003). The test was standardized and normed so one could compare an individual's score to the average score found in the general population, which made it appealing to schools (Lagemann, 2000). Wechsler (1939) found the method of deriving an IQ to be insufficient because of the fact that cognitive skills did not develop in a linear fashion. He subsequently published the Wechsler Intelligence Scale for Children

(Wechsler, 1949) and the Wechsler Adult Intelligence Scale (Thorndike & Lohman, 1990; Wechsler, 1955).

Advancements in education and psychology at the turn of the twentieth century brought empirical and scientific credibility to the field of gifted education (National Association for Gifted Children, 2008). The term *gifted* was initially used to describe students who are able to work through course curriculum faster, and whose work is measurably different from that of average students (Henry, 1920; Whipple, 1919).

2.2.2 History of the Field of Gifted Education

The early studies of giftedness in the 1920s evolved from research on mental inheritance, subnormal children, construction of instruments to measure both the sub-normal and super-normal, and the realization that existing schools could not adequately meet the needs of all children. Terman's (1925) study on genetic genius and Hollingworth's (1926) study on socially optimal intelligence spearheaded the movement and conducted some of the first widely-published research studies on gifted children. As a result of their research, Terman and Hollingsworth are seen as the foremost pioneering researchers in gifted education (Jolly & Kettler, 2008).

During the mid-1920s, the use of group intelligence tests had become more popular within United States schools (Valencia & Suzuki, 2001), and schools began differentiating curriculum based on the results of these assessments.

In the 1930s and 1940s, Witty (1940) emerged as one of the leading spokespersons of gifted education. He cautioned against the reliance on IQ as the only means of identification for giftedness (Tannenbaum, 1983), advocating a more liberal definition: "If by gifted children we mean those youngsters who give promise of creativity of a high order, it is doubtful if the typical intelligence test is suitable for use in identifying them" (Witty, 1940, p. 504). Witty acknowledged the potentialities of children who excel in art, writing, and social leadership, recommending that the definition of giftedness "consider any child gifted whose performance, in a potentially valuable line of human activity, is consistently remarkable" (1958, p. 62).

In 1951, Witty edited *The Gifted Child*, a book published by the American Association for Gifted Children, which helped to increase interest in gifted education (Nazarro, 1977; Tannenbaum, 1983). However, two years later, Heck (1953) found that only 15 (0.5%) of 32,203 large cities (with populations of 2,500 or more) in the United States offered special classes or schools for gifted students.

In 1957, the Russian launch of the Sputnik satellite into space gave birth to the space race between Russia and the United States. Consequently, the United States placed an immediate priority on gifted students, especially in the subjects of mathematics, science, and technology. Tannenbaum (1983) asserted that the United States had "to earmark superior students for an enriched education and…dedicate their abilities to the defense of their country" (p. 20). Hence, gifted programs were launched across the United States to ensure that the nation would have the intellectual resources needed to effectively win the space race. Coursework was telescoped for gifted students and college courses were offered for students in high school (Colangelo & Davis, 2003). There was a "total talent mobilization" in the United States immediately after the Sputnik launch (Tannenbaum, 1979, p. 12). However, the mobilization effort was short-lived and, by 1963, the focus on education in the United States had shifted from gifted education to special education.

The next resurgence of gifted education occurred when the former United States Commissioner of Education, Sidney P. Marland, Jr., in his 1972 report to Congress, presented the first federal definition of giftedness and urged school districts throughout the nation to adopt it:

> Gifted and talented children are those identified by professionally qualified persons who by virtue of outstanding abilities are capable of high performance. These are children who require differentiated educational programs and/or services beyond those normally provided by the regular school program in order to realize their contribution to self and society. (p. 2)

Marland's report revealed wearisome statistics regarding the state of gifted education. "Prior to his report, the nation was focused on recognizing gifted students as a group and providing them with a one-size-fits-all program to nurture their academic potential" (Stephens, 2008, p. 390).

Pursuant to the Marland Report, children capable of high performance included those with demonstrated achievement and/or potential in any of the following areas:

- general intellectual ability
- specific academic aptitude
- creative or productive thinking
- leadership ability
- visual and performing arts
- psychomotor ability (later excluded in subsequent revisions of the federal definition; Marland, 1972, pp. 13–14).

Sternberg and Wagner (1982) further defined giftedness as a kind of mental self-management with the key psychological basis of intellectual giftedness residing in insight skills that include three main processes: (1) separating relevant from irrelevant information, (2) combining isolated pieces of information into a unified whole, and (3) relating newly-acquired information to information acquired in the past.

Gardner (1983) suggested a concept of multiple intelligences to define giftedness, stating that several lenses could be used to view the world: linguistic, logical/mathematical, spatial, musical, bodily-kinesthetic, interpersonal, and intrapersonal. Gagné (1985) proposed a clear distinction between giftedness and talent, reserving the term giftedness as a designation for the possession and use of untrained and spontaneously expressed natural abilities, known as aptitudes, in at least one ability domain to a degree that places a child among the top 10% of his or her peers. Furthermore, Renzulli (1986) asserted that gifted behavior reflects an interaction among three basic clusters of human traits: above-average general and/or specific abilities, high levels of task commitment, and high levels of creativity. According to Renzulli, gifted children are those who possess, or are capable of developing, this composite of traits and applying them to any potentially valuable area of human performance.

Regardless of the varying threshold of eligibility, giftedness can be found in all cultures and is expressed through a variety of behaviors (Baldwin, 2005).

At the national level in the United States, with the passing of the Jacob K. Javits Gifted and Talented Students Education Act of 1988 (part of the Elementary and Secondary Education Act) gifted students were declared a resource and deemed critical to the nation's progress (Piirto, 2007; Ward, 2005). However, as a result of the No Child Left Behind Act of 2001 (2002), monies once allocated for gifted programming were regularly redirected to programs focused on mastering proficiencies for all students (Piirto, 2007). In 2011, the federal appropriations were depleted as part of a final continuing resolution to withdraw financial support (U.S. House of Representatives, 2011).

Tannenbaum (1983) poignantly noted, "The cyclical nature of interest in the gifted is probably unique in American education. No other special group of children has been so alternately embraced and repelled with so much rigor by educators and laypersons alike" (p.16). Jolly and Kettler (2008) have likened the nation's wavering commitment to gifted education to that of a "pendulum swing"—postulating that "gifted and talented students become a national priority when excellence is sought and a critical need is perceived" (p. 37).

2.2.3 Curriculum and Instruction for Gifted Students

Brain research has revealed that learning takes place when students' abilities and interests are stimulated by the appropriate level of challenge (Caine & Caine, 1991; Howard, 1994; Jensen, 1998; Sousa, 2001; Wolfe, 2001). When students are not presented with learning experiences that are appropriate for their abilities, they can lose motivation and sometimes even their interest in learning and school. Gredler, Broussard and Garrison (2004) broadly defined motivation as the attribute that moves one to do or not to do something. Researchers argue that encouraging motivation in children is critical because it often predicts motivation later in life (Broussard & Garrison, 2004; Gottfried, 1990). Research further suggests that the brain will not maintain its level of development if students are not challenged (Clark, 1997). When tasks are not sufficiently challenging, the brain does not release enough of the chemicals needed for learning, such as dopamine, noradrenalin, serotonin, and other neurochemicals (Schultz, Dayan, & Montague, 1997). Conversely, when students face tasks at moderate levels of difficulty, they are more likely to withstand efforts to

learn, even when confronted with difficulty (Bransford, Brown, & Cocking, 2000; Csikszentmihalyi, Rathunde, & Whalen, 1993; Rohrkemper, 1989).

Like so many parts of the human body, the brain also works best when it is used, rather than dormant (Vaillant, 2002). Therefore, in order to provide gifted students with curricula that prepare them for the 'real world', it is necessary to provide rich learning experiences and build flexibility into the curriculum. Daggett (2005) refers to this curriculum as one demanding rigor and relevance. Karnes and Bean (2005) refer to it as depth and complexity.

Accordingly, experts in the field of gifted education have recommended that modifications be made to the curriculum for, and instruction of, gifted learners. Maker and Nielson (1996) advocated differentiating the delivery of the curriculum for gifted students by increasing the level of abstractness and complexity in lessons. A 'differentiated' classroom is one in which a teacher provides an assortment of avenues to content, process, and products in response to the readiness levels, interests, and learning profiles of the complete range of academic diversity in his or her classroom (Tomlinson, 1995). This instructional approach, often referred to as *differentiated instruction*, addresses individual learning needs and adjusts instruction to fit the skills and experience level of each student in a classroom (Smutny, 2003).

Tomlinson (1999) indicated that, because there is no one 'right way' to create an effectively differentiated classroom, teachers need to incorporate an assortment of teaching techniques and pedagogical strategies that provide students with a variety of opportunities to engage in the learning process. Differentiation can be defined as an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the various needs of individual students and maximize their learning opportunities (Bearne, 1996; Tomlinson, 1999).

Recommended curricular modifications for gifted students have been suggested, particularly in terms of science and mathematics. In general, the science curriculum should allow students to delve into important ideas and thought processes (Boyce, Bailey, Sher, Johnson, VanTassel-Baska, & Gallagher, 1993). Researchers

recommend that the science curriculum for a gifted classroom should progress at a faster pace and feature less repetition than that of a regular classroom (Boyce et al., 1993; Stepanek, 1999).

VanTassel-Baska (1994) identified the following key components of the science curriculum for gifted students:

- The content should be significant and deep.
- There should be an emphasis on understanding concepts rather than memorizing facts.
- An inquiry approach should be used, with students as active investigators.
- Opportunities should exist for students to make interdisciplinary connections.
- There should be an ability for students to investigate real problems and situations.
- Instructors should guide students toward scientific habits of mind.

Greenes (1981) opined that mathematically gifted students differ from non-gifted students studying mathematics in the following abilities: spontaneous formation of problems, flexibility in handling data, mental agility of fluency of ideas, data organization ability, originality of interpretation, ability to transfer ideas, and ability to generalize. Hoeflinger (1998) found that mathematically gifted students share the common characteristic of problem solving by internalizing, reshaping, and questioning. Johnson and Sher (1997) argued that students should study advanced mathematics content at earlier grade levels. Winebrenner (1999) suggested that mathematically gifted students' needs are frequently overlooked because they complete classwork in the regular classroom without help from the teacher. Johnson (1993) identified key components of the mathematics curriculum for gifted students:

- The content should be of greater depth and higher levels of complexity.
- A discovery approach should be used that encourages students to explore concepts.
- There should be a focus on solving complex, open-ended problems.
- Opportunities for interdisciplinary connections should exist.

2.2.4 Gifted Education Versus Non-Gifted Education in Middle Schooling

The educational system in the United States has long struggled with the competing values of equity and excellence throughout its history (Gardner, 1961). The same holds true for the domain of gifted education. Historically, tension has existed between gifted education and general, non-gifted, middle-school education (Tomlinson, 1992). Colangelo and Davis (2003) referred to the dynamic as a 'love–hate' relationship. Davis and Rimm (1998) have proffered that gifted education is caught between both excellence and equity—desiring to help gifted students achieve their potential while defending the argument that gifted programs are elitist and inequitable.

Advocates of gifted education argue that, just like any other group, gifted students have different interests, areas of strength, ability levels, and temperaments. Neither is there a definitive list of gifted characteristics, nor will all students' needs be met with the same strategies (Parke, 1989). Gifted students need different content and instruction in order to meet their needs (Winner, 1996). In general, the premise of gifted education stresses practices that are most likely to promote expertise in learners with advanced performance and/or potential.

However, for the most part, the non-gifted middle-school advocate's view of education is that all students have an equal opportunity to succeed. According to Beane (1990), middle-school educators of non-gifted students argue that what has been called 'gifted education' is good education for all learners and, therefore, should not be reserved for any single group of middle-school students. They believe that educators' efforts should be focused on establishing the same quality of education in heterogeneous classrooms and that the proliferation of such classrooms would serve all middle-school students well (Carnegie Task Force on the Education of Young Adolescents, 1989; National Middle School Association, 1995). Advocates for more inclusive classrooms have called for a reduction to the homogeneous grouping of students by ability, basing their platform on equity of learning opportunity (Kozol, 1991; Oakes, 1985, Page, 1991; Slavin, 1987; Wheelock, 1992).

2.2.5 Current State of Gifted Education

Tomlinson et al. (2003) argued that, for gifted students, "differentiation must be conceived and practiced as a reflection and extension of educational best practice, not a substitute for it" (p. 131). Lou et al. (1996) agreed with the necessity of differentiating instruction for academically diverse students and acknowledged that the mosaic of students often presents teachers with complex pedagogical dilemmas. However, if the modified curriculum and instruction for academically diverse learners are not sound, student outcomes are likely to be disappointing (Gamoran & Weinstein, 1995; Hootstein, 1998). Borland (2003) asserted that, in order to make schools effective for gifted students, the differentiation of curriculum and instruction should be the norm rather than the exception.

Conversely, evidence about the experiences of high-functioning students in school indicates that, on average, they are not being challenged and their learning needs are not being met in the regular classroom (Moon, Tomlinson, & Callahan, 1995; Kulik & Kulik, 1987; Delcourt, Loyd, Cornell, & Goldberg, 1994). Mathematics and science curricula, for example, as they are conventionally taught, are often inappropriate for gifted students because they are highly repetitive and provide little depth (Johnson, Boyce, & VanTassel-Baska, 1995; Johnson & Sher, 1997). Research indicates that the needs of mathematically gifted students are consistently not met in the regular classroom (Archbaumlt et al., 1993). A national study conducted with gifted elementary students found that an average of 35% to 50% of the regular curriculum could be eliminated for gifted learners (Reis & Purcell, 1993). The process of eliminating material from an established curriculum, referred to as c*urriculum compacting*, pre-assesses gifted students to determine what parts of the curriculum they have already mastered, enabling them to work on alternative assignments (Renzulli & Smith, 1978). Reis, Westberg, Kulikowich, and Purcell (1998) conducted a study with 336 teachers and found that 40% to 50% of the regular curriculum could be eliminated for gifted students without hindering their ability to score highly on mathematics and science assessments.

As noted previously in Section 2.2.4, heterogeneous instruction can be viewed as appealing because it addresses equity of opportunity for a broad range of learners. Gamoran and Weinstein (1995) contested that mixed-ability classrooms are likely to

fall short of their promise unless teachers address the learner variance within these classrooms. Only when students receive instruction suited to their varied readiness levels, interests, and learning preferences are such settings beneficial for them (McLaughlin & Talbert, 1993). Tomlinson et al. (2003) argued that, while many teachers acknowledge academic diversity in their classrooms and affirm the need to addresses student variance, their practice tends to be misaligned with those beliefs. This presents a lingering concern as to whether the needs of gifted learners are adequately being met in heterogeneous, mainstream classrooms. Even when special pull-out services exist for gifted learners immersed in heterogeneous classrooms, the majority of students actually spend the bulk of their school careers in heterogeneous classrooms (Tomlinson et al., 2003). The National Research Center on the Gifted and Talented has reported extensive research on the instruction that gifted students receive in heterogeneous classrooms throughout the United States, which is of particular relevance to the present study:

- Moon et al.'s (1995) nationwide study among 449 middle-school teachers and 500 middle-school principals revealed that 50% of respondents did not differentiate instruction based on students' readiness, interest, or learning profile (efficiency/preferred mode of learning) because the teachers did not see the need.
- The Classroom Practices Survey (Archambault et al., 1993), involving data from a sample of 7,300 educators, indicated that teachers made only minor modifications on an irregular basis, or none at all, to accommodate gifted students in their classrooms. The teachers who did report making adjustments usually did so by assigning more advanced reading materials, providing enrichment worksheets, or asking students to complete extra reports.
- A qualitative study conducted in 46 classrooms across the United States by Westberg, Archambault, Dobyns, and Salvin (1993) found that, in the regular classroom, 84% of the instructional activities were the same for all students, whether gifted or not.
- Westberg, Dobyns, and Archambault (1990) developed the Classroom Practices Record (CPR) in order to record information about the occurrences and types of instructional and curricular differentiation provided by regular classroom teachers to targeted gifted students. The Classroom Practices Observation Study (Westberg et al., 1993) used the CPR to investigate

> whether the needs of 92 gifted and 92 non-gifted students were being met in the heterogeneous, mainstream classroom. The study revealed that, in 84% of classroom activities, gifted students received no instructional or curricular differentiation of any kind. Furthermore, the gifted students received only a limited amount of differentiation in reading, language arts, mathematics, science, and social studies instruction. Westberg et al. (1993) found this to be of particular concern because special services provided to gifted students outside the regular classroom have been eliminated and/or reduced (in many cases to one or two hours per week) in many parts of the United States as a result of economic problems and budgetary restraints.

It appears that, in spite of the existing techniques and strategies available, teachers are failing to meet the unique needs of gifted learners. Starko and Schack (1989) found that teachers, as a result of not always receiving necessary training in how to differentiate instruction, often rely on familiar methods rather than choosing strategies based on the specific needs of gifted students in their classes. The common justification for teaching all students in the same way is that schools are organized around the notion that students who are at the same age also have the same level of readiness and ability (Stepanek, 1999). Classroom teachers, however, can learn to differentiate curriculum and instruction in their regular classroom situations and to extend gifted education strategies and pedagogy to all content areas (Colangelo et al., 2004; Gavin et al., 2007; Gentry & Owen, 1999; Reis, Gentry, & Maxfield, 1998).

However, in many cases in which teachers have attempted differentiation, their methods have been deemed limiting and ineffective (Schumm et al., 1995; Stradling & Saunders, 1993). Several studies have reported that such instructional modifications are likely to be improvisational or reactive, as opposed to preplanned or proactive (Hootstein, 1998; McIntosh, Vaughn, Schumm, Haager, & Lee, 1994; Schumm & Vaughn, 1992, 1995; Tomlinson, 1995). Additionally, instruction in which comprehension of content is sacrificed to coverage of content and lack of teacher preparation has been found to impede effective differentiation (Schumm & Vaughn, 1995; Tomlinson et al., 1997; Vaughn & Schumm, 1994). The high-stakes

testing often required of students is also probably compounding the problem of effective differentiation (Callahan et al., 2003; Vaughn & Schumm, 1994).

On the whole, it appears that the vast majority of past research related to gifted education has concentrated on teachers' perspectives of gifted curriculum and instruction. Moreover, past studies have seemingly overlooked the perspectives of gifted students in terms of their classroom learning environments. Consequently, much can be gained by investigating the experiences of gifted students, specifically related to the field of learning environments.

2.3 History of the Field of Learning Environments

Given that students spend up to 15,000 hours in the school context by the time they graduate from senior high school (Berk, 2002; Rutter, Maughan, Mortimore, Ouston, & Smith, 1979), and up to 20,000 hours in classrooms by the time they graduate from university (Fraser, 2002a), students' reactions to, and observations of, their school experiences—specifically their learning environments—are of great significance. Fraser (2012) further opined that "students are at a good vantage point to make judgments about classrooms because they have encountered many different learning environments and have enough time in a class to form accurate impressions" (p. 1191).

The term *learning environment* refers to the social, physical, psychological, and pedagogical context in which learning occurs and which affects student achievement and attitudes (Fraser, 1998a). Educational research has revealed connections between the learning environment and academic outcomes, and it is now well known that learning environments strongly influence student outcomes and play an important role in improving the effectiveness of learning (Fraser, 1998b, 2001, 2012).

Lewin (1936) developed the fundamental ideas pertinent to the field of learning environments. This psychologist's field theory acknowledged that the environment and its interaction with individuals' personal characteristics are strong determinants of human behavior. Lewin contended that one's behavior must be determined for every

kind of psychological event, including one's actions, emotions, and expressions, for the momentary structure and the state of the person, and for the psychological environment. Lewin advocated updated research strategies in which behavior would be accepted as a relevant function to the individual and his or her environment. Lewin's formula, $B = f(P, E)$, depicts the environment as a determinant of human behavior. Behavior (B) is a function (f) of the person (P) and his or her environment (E). Lewin, recognized as the 'founder of modern social psychology', pioneered the efforts of utilizing scientific methods and experimentation to examine social behavior (Marrow, 1977).

Murray (1938), a humanist psychologist who referred to himself as a *personalogist*—one who describes, explains, and predict human behavior on the basis of conceptual systems known as personality theories (Hall & Lindzey, 1979)—was also attracted to the internal determinants of behavior. Murray opined that Lewin had overlooked developing a theory of drive or need, as Lewin had been solely interested in the external determinants of behavior. Murray's *needs-press* model corrected the omission by including the situational variables which are found in the environment and which account for a degree of behavioral difference. Murray made a distinction between 'needs' and 'press.' He defined *needs* as "...a force (the physico-chemical nature of which is unknown) in the brain region…which organizes perception, apperception, intellection, conation, and action in such a way as to transform in a certain direction an existing, unsatisfying situation" (Murray, 1938, p. 124). Murray further developed the concept of 'needs' by coining the terms *latent needs* (not openly displayed) and *manifest needs* (observed in people's actions). *Press* was defined as "a temporal gestalt of stimuli which usually appears in the guise of a threat of harm or promise of benefit to the organism" (Murray, 1938, p. 124) or, more simply put, the external influences on motivation.

Moreover, Murray made a distinction between *alpha press* (the environment as observed by an external observer) and *beta press* (the environment as perceived by people themselves). Consequently, Murray's needs-press model complemented Lewin's formula by depicting personality characteristics as goal oriented and environmental characteristics as external (either positive or negative to the personality needs of an individual).

Thus, Lewin and Murray are widely accredited with having established the groundwork for substantive research as it pertains to classroom learning environments.

Withall (1949) was one of the first researchers to attempt to categorize and observe interactions in the classroom using trained observers who recorded elements of interaction. Getzels and Thelen (1960) created a framework for the analysis of classroom structures as a unique social system. However, although researchers had given weighted consideration to the dynamics of learning environments, a systematic process for inquiry into the interaction of students within formal classroom structures was not in place. Doyle (1979) proposed that a strong emphasis should be placed on inter-relationships and communications among all members of the classroom community when assessing classroom environments. Doyle's theory emphasized that, while learning is a concealed process, it takes place in school within the multifaceted social world of the classroom (Desforges & Cockburn, 1987).

Murray's notions regarding beta press were further differentiated by Stern, Stein, and Bloom (1956) as either *private beta press* (an individual's view of his or her environment) or *consensual beta press* (the collective view of a group as a whole). Private and consensual beta press could be different from each other, and both could differ from the detached view of alpha press of a skilled nonparticipant observer (Fraser, 2012). Stern (1970) advanced the existing framework by simplifying Murray's conceptual definitions. To Stern, 'needs' referred to organizational tendencies that appear to give unity and direction to a person's behavior and 'press' referred to the phenomenological world of the individual—the unique and inevitable private view that each person has of the events in which the individual takes part (Stern, 1970).

Ultimately, it was determined that students' perceptions of a wide range of instructional and social cues relevant to their own learning can be acquired within the time of a classroom lesson (Walberg & Anderson, 1972). Questioning students about their perceptions presents an advantage over observations of teachers in that it receives input from a much larger sample and is based on many hours of experiential observations by students (Fraser, 1991). Stewart (1979) made the distinction between

school-level and classroom-level environment research. He found that classroom-level research tends to focus on relationships between the students and their teacher, whereas school-level research is more concerned with relationships between teachers and other teachers as well as administrators and heads of department.

The first human environments questionnaires for use in the educational arena were developed in the late 1960s in the United States. The Learning Environment Inventory (LEI) was created by Walberg (1968) as part of the research and evaluation activities of Harvard University's Harvard Project Physics, a national curriculum development project for secondary school physics (Walberg & Anderson, 1968). Walberg's research demonstrated that classroom climate could be reliably and economically measured with the use of high-inference measures. Thus, he confirmed that individual students' satisfaction with the climate of a classroom would enhance learning, verifying that climate variables were good predictors of student learning outcomes (Anderson & Walberg, 1974).

At the same time, at Stanford University, Moos (1979) began developing the first of his social climate scales, eventually resulting in the development of the Classroom Environment Scale (CES) (Moos & Trickett, 1974; Trickett & Moos, 1973). The CES was based on research involving perceptual measures of a variety of human environments (e.g. psychiatric hospitals, correctional facilities, university residences, and work milieus) (Moos, 1974). The published CES contains nine scales with 10 items of True–False response format in each scale.

Moos (1979) articulated three dimensions for classifying human environments:

- Personal Development Dimensions (which assess basic directions along which personal growth and self-enhancement tend to occur)
- 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)
- System Maintenance Change Dimensions (which involve the extent to which the environment is orderly, clear expectations, maintain control and is responsive to change).

As a result of the work of Walberg and Moos, classroom learning environments research has grown to include the development and application of numerous other learning environment instruments (Fraser, 1986, 1991, 1994, 1998a, 2012; Goh & Khine, 2002; Wubbels & Levy, 1993). The work of both Walberg and Moos has inspired many diverse research programs around the world (Fraser, 1994, 1998b, 2012).

2.4 Range of Learning Environment Questionnaires

Over the past several decades, a range of widely-applicable questionnaires have been developed for assessing students' perceptions of their learning environments (Fraser, 1998a, 1998b, 2007, 2012). This section describes nine notable classroom learning environment instruments that encompass Moos' three basic types of dimensions, namely:

- 2.4.1 Learning Environment Inventory (LEI)
- 2.4.2 Classroom Environment Scale (CES)
- 2.4.3 Individualized Classroom Environment Questionnaire (ICEQ)
- 2.4.4 My Class Inventory (MCI)
- 2.4.5 College and University Classroom Environment Inventory (CUCEI)
- 2.4.6 Questionnaire on Teacher Interaction (QTI)
- 2.4.7 Science Laboratory Environment Inventory (SLEI)
- 2.4.8 Constructivist Learning Environment Survey (CLES)
- 2.4.9 Place-based and Constructivist Environment Survey (PLACES) and SMILES.

Table 2.1 summarizes nine notable and frequently-used learning environment instruments. The table provides the name of each instrument and identifies at what level the instrument is best used for, its authors, year of development, and the number of items per scale. The table also classifies each scale according to Moos' scheme: relationship dimensions, personal development dimensions, and system maintenance and change dimensions.

TABLE 2.1 Overview of Nine Classroom Environment Instruments: LEI, CES, ICEQ, MCI, CUCEI, QTI, SLEI, CLES, and PLACES/SMILES

			Scale Classified According to Moos' Scheme		
Instrument	Level	Items per Scale	Relationship Dimension	Personal Development Dimension	System Maintenance and Change Dimension
Learning Environments Inventory (LEI)	Secondary	7	Cohesiveness Friction Favoritism Cliqueness Satisfaction Apathy	Speed Difficulty Competitiveness	Diversity Formality Material Environment Goal Direction Disorganization
Classroom Environment Scale (CES)	Secondary	10	Involvement Affiliation Teacher Support	Task Orientation	Order and Organization Rule Clarity Teacher Control Innovation
Individualized Classroom Environment Questionnaire (ICEQ)	Secondary	10	Personalization Participation	Independence Investigation	Differentiation
My Class Inventory (MCI)	Elementary	6–9	Cohesiveness Friction Satisfaction	Difficulty Competitiveness	
College and University Classroom Environment Inventory (CUCEI)	Higher Education	7	Personalization Involvement Student Cohesiveness Satisfaction	Task Orientation	Innovation Individualization
Questionnaire on Teacher Interaction (QTI)	Secondary or Primary	8–10	Leadership Helpful/Friendly Understanding Student Responsibility and Freedom Uncertain Dissatisfied Admonishing Strict		
Science Laboratory Environment Inventory (SLEI)	Upper Secondary or Higher Education	7	Student Cohesiveness	Open-Endedness Integration	Rule Clarity Material Environment
Constructivist Learning Environment Survey (CLES)	Secondary	7	Personal Relevance Uncertainty	Critical Voice Shared Control Investigation	Student Negotiation
Place-based and Constructivist Environment Survey (PLACES) and SMILES	Elementary	8	Relevance/ Integration Group Cohesiveness Student Involvement	Critical Voice Shared Control Open-Endedness	Student Negotiation Environmental Interaction

Note. Adapted from Fraser (2012).

2.4.1 Learning Environment Inventory (LEI)

The initial development of the LEI began in the late 1960s in conjunction with the evaluation and research related to Harvard Project Physics (Walberg & Anderson, 1968). Walberg's Social Climate Questionnaire provided the basis for the original version of the LEI (Walberg, 1968). The final version of the LEI contains a total of 105 statements with seven descriptors. Student respondents use a four-point Likert response scale of Strongly Disagree, Disagree, Agree, and Strongly Agree. To reduce response bias on the part of the respondent, some items are negatively phrased.

Ellett and Walberg (1979) noted the widespread use of the LEI throughout the world, in over 300 investigations, some of which are described by Fraser (1986), Randhawa and Fu (1973), and Walberg, Singh, and Rasher (1977).

2.4.2 Classroom Environment Scale (CES)

The Classroom Environment Scale (CES), developed by Moos at Stanford University, is based on other social climate scales for various human environments (Fisher & Fraser, 1983; Moos, 1979; Moos & Trickett, 1987). The CES was created as part of a comprehensive set of perceptual measures of a variety of human environments, including psychiatric hospitals, correctional facilities, university residences, and work environments (Moos, 1974). The original version of the CES consisted of 242 items representing 13 conceptual dimensions (Trickett & Moos, 1973). The final published version includes a test manual, questionnaire with nine scales with 10 items of True–False response format, answer sheet, and transparent hand-scoring key (Moos & Trickett, 1987).

2.4.3 Individualized Classroom Environment Questionnaire (ICEQ)

The Individualized Classroom Environment Questionnaire (ICEQ) was developed to assess individualized classrooms as distinct from conventional ones. The initial version of the ICEQ was developed by Rentoul and Fraser (1979) after reviewing literature on individualized open and inquiry-based education, interviewing teachers and secondary school students, and appraising reactions to draft versions from experts, teachers, and middle-school students. The tool assesses individualized dimensions within the classroom, such as participation and personalization (Fraser, 1990; Rentoul & Fraser, 1979). The final, shorter version of the ICEQ contains 50

items (10 items in each of five scales) assessing Personalization, Participation, Independence, Investigation, and Differentiation. Respondents use a five-point frequency response format with the alternatives of Almost Never, Seldom, Sometimes, Often, and Very Often. To avoid a biased response from the respondent, various items are negatively phrased.

2.4.4 My Class Inventory (MCI)

The My Class Inventory (MCI) questionnaire, developed by Fraser, Anderson, and Walberg (1982), is essentially a simplified version of the LEI with an intended use for children aged 8–12 years. The original version of the MCI was simplified by Fisher and Fraser (1981), and then by Fraser and O'Brien (1985) who developed an even shorter version of the questionnaire with 25 items. Although initially developed for the elementary level, the MCI has subsequently been used at the middle-school level, especially with students who have difficulties in reading English.

There are four notable differences between the MCI and the LEI:

- In order to minimize fatigue among younger students, the MCI contains only five of the LEI's original 15 scales.
- The wording has been simplified.
- The four-point scale used for the LEI has been reduced to a two-point Yes/No scale.
- The MCI employs a total of 38 items in five scales (long scale) or 25 items (short scale).

Goh and Fraser (1998) modified the MCI to include a three-point response format (Seldom, Sometimes, and Most of the Time) with a Task Orientation Scale. This modified version was used with Singapore among primary mathematics students.

Majeed, Fraser, and Aldridge (2002) used the MCI in Brunei Darussalam in a study involving a sample of 1,565 lower-secondary mathematics students in 81 classes in 15 government schools. This study is noteworthy because, when the survey's Satisfaction scale was removed and used an outcome variable, a satisfactory factor structure was established, as was sound reliability for a refined three-scale version of the MCI assessing Cohesiveness, Difficulty, and Competition. This study reported

sex differences in learning environment perceptions and associations between students' satisfaction and the nature of the classroom learning environment.

Sink and Spencer (2005) used the MCI in the United States with a sample of 2,835 students in Grades 4, 5 and 6 in an urban school district within Washington State. In this study, an 18-item four-scale modified version of the MCI was found to be psychometrically sound. This study is noteworthy because the researchers present a sound rationale for the MCI to be used as an accountability tool for elementary-school counselors.

Another noteworthy study that employed the MCI was conducted by Scott Houston, Fraser, and Ledbetter (2008) in the United States with a sample of 588 students in Grades 3, 4, and 5 within the State of Texas. In this study, the results supported the validity of the MCI and suggested that the use of science kits in elementary classrooms was associated with a more positive learning environment in terms of student satisfaction and cohesiveness.

2.4.5 College and University Classroom Environment Inventory (CUCEI)

The College and University Classroom Environment Inventory (CUCEI) was developed by Fraser and Treagust (1986) specifically to assess classroom learning environments in higher education. Fraser, Treagust, Williamson, and Tobin (1987) reported that, despite the existence of strong traditional classroom environment research at the primary and secondary level, surprisingly little work had been done at the higher education levels because of the shortage of suitable instruments. Hence, the CUCEI was developed to fill this void (Fraser, Treagust, & Dennis, 1986).

The instrument was designed to evaluate students' perceptions in small class settings of about 30 students, often referred to as seminars (Fraser & Treagust, 1986; Fraser, Treagust, & Dennis, 1986). The final version of the CUCEI contains seven scales: Personalization, Involvement, Student Cohesiveness, Satisfaction, Task Orientation, Innovation, and Individualization. Each scale contains seven items, making a total of 49 items in all. There are four responses provided for each item, namely, Strongly Agree, Agree, Disagree, and Strongly Disagree. Additionally, the polarity (positive/negative phrasing) is reversed for approximately half of the items.

Fraser, Williamson, and Tobin (1987) conducted a study using the CUCEI in Australia with a sample of 536 students in 45 classes in order to evaluate involvement, satisfaction, innovation, and individualization in alternative high schools. The study compared environmental perceptions of Australian students enrolled in an alternative high school geared to adult learners with the perceptions of students enrolled in more traditional educational settings. The researchers found differences between school types on all seven scales of the CUCEI instrument, with evening technical school being rated most favorably.

Nair and Fisher (2000) confirmed the reliability and validity of a modified and personalized version of the CUCEI instrument. Their study, conducted in Australia and Canada with a sample of 504 students and 24 instructors in science classes at senior secondary and tertiary levels, replaced the Involvement and Satisfaction scales with Cooperation and Equity scales. The Cooperation scale measures the extent to which students cooperate rather than compete with one another on learning tasks. The Equity scale allows investigation of students' perceptions of the environment with respect to gender. Additionally, Nair and Fisher changed the response choices from the original four-point Likert rating scale to a five-point frequency rating scale of Almost Never, Seldom, Sometimes, Often, and Almost Always.

Logan, Crump, and Rennie (2006) conducted two studies using Nair and Fisher's (2000) modified actual and preferred versions of the CUCEI in computing classrooms in New Zealand. Their samples consisted of 265 students from seven secondary schools and 125 students from three tertiary institutions. The researchers found that the CUCEI's psychometric performance was not ideal without some modifications being made.

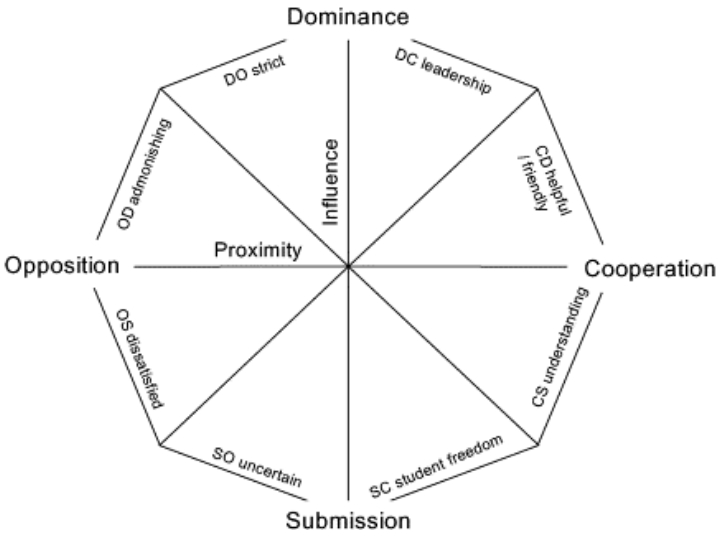
2.4.6 Questionnaire on Teacher Interaction (QTI)

The Questionnaire on Teacher Interaction (QTI) was originally developed in the Dutch language as part of a teacher education project at the University of Utrecht, Holland (Wubbels & Brekelmans, 2012; Wubbels, Créton, & Hooymayers, 1985). Underpinning the QTI is the theory on communication processes developed by Watzlawick, Beavin, and Jackson (1967), in which it is assumed that the behaviors of participants influence each other mutually. Fisher, Fraser, and Cresswell (1995)

referred to this process as "circular communication" (p. 8) because the behavior of the teacher is influenced by the behavior of the students which, successively, influences student behavior.

Wubbels et al. (1985) expounded upon the work of Leary (1957) in order to map interpersonal teacher behavior. Leary's model for interpersonal relationships has been extensively investigated in clinical psychology and psychotherapeutic settings (Strack, 1996) and has been proven to describe interpersonal relationships (Foa, 1961; Lonner 1980). Modifying Leary's theoretical model for the field of education, the QTI maps teacher behavior with a Proximity dimension (Cooperation–Opposition) and an Influence dimension (Dominance–Submission) to assess students' perceptions of eight behavior aspects exhibited by teachers: Leadership, Helpful/Friendly, Understanding, Student Responsibility and Freedom, Uncertain, Dissatisfied, Admonishing, and Strict. The original version of the QTI has 77 items divided among eight scales. Wubbels and Levy (1991) constructed a shorter, 64-item version in the United States. A 48-item version was constructed in Australia by Fisher, Fraser, and Wubbels (1993).

The QTI has a 5-point response scale, ranging from Never/Not At All to Always/Very Often. Figure 2.1 shows a graphic representation of the Model for Interpersonal Teacher Behavior.



Note. Adapted from Wubbels and Levy (1993).

Figure 2.1 Model for Interpersonal Teacher Behavior

Wubbels, Brekelmans, and Hooymayers (1991) validated the original 77-item version of the QTI in the Netherlands. This study also investigated relationships between perceptions on the QTI scales and student outcomes. The researchers found that the more that teachers demonstrated strict, leadership, and helpful/friendly behavior, the higher were the students' cognitive outcome scores. Conversely, student responsibility and freedom, uncertain, and dissatisfied behavior were related negatively to cognitive outcome scores.

In another notable study, Wubbels (1993) used the QTI with a sample of 792 students and 46 teachers in Australia. The results of this study revealed that, generally, teachers did not achieve the behavior that they considered to be ideal. Nevertheless, teachers perceived their own behavior as more favorable than did their students. Students perceived their best teachers as stronger leaders, more friendly and understanding, and less uncertain, dissatisfied, and admonishing than other teachers.

The modified 48-item (8 scales with 6 items in each scale) version of the QTI was used in Singapore by Goh and Fraser (1996) with a sample of 1,512 primary mathematics students in 39 classes from 13 schools. Not only did this study cross-validate the QTI in Singapore, but the instrument was found to be useful in several research applications.

Confirmation of the reliability and validity of English versions of the QTI has been established cross-culturally in the following countries: Australia (Fisher, Henderson, & Fraser, 1995), Brunei Darussalam (Khine & Fisher, 2002; Riah & Fraser, 1998), the Netherlands (Brekelmans, Wubbels, & Créton, 1990; den Brok, 2001; Wubbels et al., 1995), Singapore (Fisher, Rickards, Goh, & Wong, 1997; Goh & Fraser, 1996, 1998, 2000; Quek, Wong, & Fraser, 2005), and the United States (Wubbels & Levy, 1993). Additionally, the QTI has been translated and successfully cross-validated in the following languages and countries: Standard Malay in Brunei Darussalam (Scott & Fisher, 2004), Korean in Korea (Kim, Fisher, & Fraser, 2000; Lee, Fraser, & Fisher, 2003), and Indonesian in Indonesia (Soerjaningsih, Fraser, & Aldridge, 2001). Brekelmans et al. (2005) reported that versions of the QTI also exist in the following languages: Dutch, English, Finnish, German, Hebrew, Indonesian, Norwegian, Russian, Singaporean Mandarin Chinese, Slovenian, Spanish, and Swedish.

The QTI has paved the way for the development of other learning environment instruments (den Brok, 2001). Kremer-Hayon and Wubbels (1992) used the eight scales of the QTI to develop the Questionnaire on Supervisor Interaction intended to assess interactions between student teachers and their supervising teachers. Fisher and Cresswell (1998) modified the QTI to form the Principal Interaction Questionnaire (PIQ) in which teachers assess the interpersonal behavior of their supervising principals.

The QTI has proven to be a valuable tool in research and teacher training, particularly because of the instrument's strong theoretical framework and the opportunity that it affords to compare perceptions of various players in the classroom situation (Brekelmans et al., 2005). Among a variety of research applications with the QTI reviewed by Wubbels and Breklemans (2012), some interesting research has traced changes in teachers' interpersonal behavior across the teaching career (Brekelmans, Wubbels, & Van Tartwijk, 2005).

2.4.7 Science Laboratory Environment Inventory (SLEI)

The Science Laboratory Environment Inventory (SLEI) was specifically developed for assessing the environment of science laboratory classes in senior high schools and institutions of higher education (Fraser, Giddings, & McRobbie, 1995). The SLEI has five seven-item scales: Student Cohesiveness, Open-Endedness, Investigation, Rule Clarity, and Material Environment. Each item involves five possible frequency responses: Almost Never, Seldom, Sometimes, Often, and Very Often.

The SLEI was field tested and validated simultaneously in six different countries (Australia, Canada, England, Israel, Nigeria, and the United States) with a sample of 5,447 high school and college students in 269 individual science laboratory classes. Fraser et al. (1995) validated parallel class and personal forms of both an actual and preferred version of the SLEI. (In Israel, Hofstein, Cohen, and Lazarowitz (1996) used Hebrew versions of the actual and preferred versions of the SLEI.)

Following the SLEI's field tests and initial validation, the instrument was cross-validated in Australia with a sample of 1,594 students in 92 classes by Fraser and McRobbie (1995) and with a sample of 489 senior high-school biology students by Fisher, Henderson, and Fraser (1997). In Singapore, Wong and Fraser (1995, 1996)

cross-validated the SLEI with a sample of 1,592 Grade 10 chemistry students from 56 classes in 28 schools. Quek et al. (2005) further cross-validated the SLEI in Singapore with a sample of 497 gifted and non-gifted chemistry students. These studies each revealed associations between the learning environment and students' affective outcomes.

The SLEI has been translated into the Korean language by Fraser and Lee (2009) in order to assess the differences between classroom learning environments of three streams: science-independent, science-oriented, and humanities. Used with a sample of 439 high-school students, the Korean version exhibited sound factorial validity and internal consistency reliability. The instrument was also able to differentiate between the perceptions of students in different classes. Students in the science-independent stream generally perceived their laboratory learning classroom environments more favorably than did students in the other two streams.

Lightburn and Fraser (2007) used the SLEI with a sample of 761 high-school biology students in 25 classes in the United States to evaluate the effectiveness of using anthropometry activities. This study further supported the SLEI's validity and revealed the use of anthropometric activities was effective in terms of both classroom learning environment and student attitudes.

2.4.8 Constructivist Learning Environment Survey (CLES)

The Constructivist Learning Environment Survey (CLES) was developed by Taylor, Fraser, and Fisher (1997) to assist researchers and teachers in assessing the extent to which a classroom's environment is consistent with a constructivist epistemology. According to the constructivist view of learning, students use and incorporate previous experiences with new information to which they might be exposed (O'Loughlin, 1992).

The CLES assesses learners' perceptions of five seven-item scales pertinent to the notion of constructivism: Personal Relevance, Uncertainty, Critical Voice, Shared Control, and Student Negotiation. Each item has a five-point response scale: Almost Never, Seldom, Sometimes, Often, and Almost Always. The CLES is available in an

actual and preferred form, with the preferred form focused on goals, value orientations, and assessing the learning environment that students would ideally like.

Taylor et al. (1997) reported sound factorial validity and internal consistency reliability for the CLES using a sample of 494 students in Grades 8 and 9 from 41 classes within 13 schools in Australia and 1,600 students in Grades 9–12 from the United States.

Nix, Fraser, and Ledbetter (2005) reported strong support for the validity of the CLES in a study conducted with a sample of 1,079 students in 59 science classes in the United States. This study used the CLES to evaluate the Integrated Science Learning Environment (ISLE), an innovative science teacher professional development program. The results revealed that students of teachers who had completed the ISLE program perceived their classrooms more favorably than students of teachers who did not attend the professional development program.

Preserving the original version's five scales, Johnson and McClure (2004) developed the CLES (20), a modified and more economical 20-item version of the CLES. In a study conducted with upper-elementary, middle-school, and high-school students and teachers, the CLES (20) exhibited strong validity and reliability.

Aldridge, Fraser, Taylor, and Chen (2000) conducted a cross-national study of middle-school science classroom learning environments in Australia and Taiwan. In Australia, the English version of the CLES was used with a sample of 1,081 students in 50 classes. In Taiwan, a Mandarin translation of the CLES was used with a sample of 1,879 students in 50 classes. Aldridge et al. (2000) reported sound validity (factor structure, reliability, and ability to differentiate between classrooms) for both the English and Mandarin versions of the CLES. The study reported that Australian classes were perceived as being more constructivist than Taiwanese classes.

Peiro and Fraser (2009) modified the CLES and translated it into Spanish. The English and Spanish versions were administered to 739 students in Grades K–3 in Miami, Florida. Data analysis supported sound validity for both the English and Spanish versions of the CLES when used with young students. Positive associations between students' attitudes and the classroom learning environment were found.

Aldridge, Fraser, and Sebela (2004) conducted a study in South Africa using the CLES with a sample of 1,864 mathematics students in Grades 4, 5, and 6 from 43 classes. This study cross-validated the CLES in South Africa by reporting sound validity (factor structure, reliability, and ability to differentiate between classrooms). Additionally, the study led to improvements in the constructivist orientation of classrooms.

Kim et al. (1999) translated the CLES into the Korean language and conducted a study in Korea with a sample of 1,083 Grade 10 and 11 students in 24 science classes from 12 different schools. Data analysis supported sound validity (factor structure, reliability, and ability to differentiate between classrooms), thus cross-validating the CLES in Korea. This study revealed statistically significant relationships between classroom learning environment and students' attitudes to science. The researchers also found that students who were exposed to a new curriculum perceived a more constructivist learning environment than students who were not exposed to a new curriculum.

2.4.9 Place-based Constructivist Environment Survey (PLACES) and SMILES

Zandvliet (2007, 2012) developed the Place-based and Constructivist Environment Survey (PLACES) as a perceptual measure unique to place-based environmental education program contexts. The literature reports many benefits of participating in place-based environmental learning programs, including students developing a greater appreciation for the environment (Basile, 2000; Corral-Verdugo & Frais-Armenta, 1996; Kenney, Price-Militana, & Horrocks-Donohue, 2003), engaging in cooperative learning (Johnson & Johnson, 2003), showing greater leadership characteristics (Cummins & Snively, 2000; Kenney, Price-Militana, & Horrocks-Donohue, 2003), and developing greater motivation while adopting more positive views and caring for the environment (Ballantyne & Packer, 1996; Cummins & Snively, 2000; Kenney, Price-Militana, & Horrocks-Donohue, 2003).

Scales from four different established learning environment instruments, including the Environment Science Learning Inventory (Henderson & Reid, 2000), the WIHIC, the SLEI, and the Science Outdoor Learning Environment Instrument (Orion, Hofstein, Tamir, & Giddings, 1994), were adapted to create the PLACES. After conducting a pilot study, the PLACES instrument was adapted for elementary age students and

code-named SMILES. The final version of the SMILES consists of three items in each of eight scales: Relevance/Integration, Critical Voice, Student Negotiation, Group Cohesiveness, Student Involvement, Shared Control, Open-Endedness, and Environmental Interaction. To accommodate elementary settings, the survey's language was simplified and a three-point Likert response scale was used.

The SMILES was validated with a sample of 169 students from Grades 4–7 enrolled at the Bowen Island Community School in British Columbia, Canada. Students responded to both an actual and preferred version of the instrument. On the preferred form, students found Group Cohesiveness and Critical Voice most important. Students generally rated the actual learning environment less positively than their preferred learning environment, which is consistent with previous studies (Fraser, 1998b, 2012). Most importantly, the scales of the SMILES support an ecological view of classrooms wherein pedagogy and environmental interaction work together to create positive learning environments.

2.5. Types of Learning Environment Research

This section presents an overview of the main types of research that have been carried out in the field of learning environments. Fraser (2002b) identified five basic lines of learning environments research as follows:

- 2.5.1 associations between student outcomes and the classroom environment
- 2.5.2 differences between student and teacher perceptions of actual and preferred environment
- 2.5.3 determinants of classroom environments (including evaluations of educational innovations)
- 2.5.4 use of qualitative research methods
- 2.5.5 cross-national studies.

2.5.1 Associations Between Student Outcomes and Environment

Past research in the field of classroom learning environments has frequently "involved investigation of associations between students' cognitive and affective learning outcomes and their perceptions of psychosocial characteristics of their classrooms"

(Fraser, 2007, p. 110). Fraser's (1994) compilation of 40 past studies in science education shows that the relationships between outcome measures and the way in which students perceive their classroom environment has been replicated for a variety of cognitive and affective outcome measures, a variety of classroom environment instruments, and a variety of samples that span numerous countries and grade levels.

Associations with students' cognitive and affective outcomes have been established using the SLEI with a sample of approximately 80 senior high-school chemistry classes in Australia (Fraser & McRobbie, 1995; McRobbie and Fraser, 1993), 489 senior high-school biology students in Australia (Fisher et al., 1997) and 1,592 grade 10 chemistry students in Singapore (Wong and Fraser, 1996).

Teh and Fraser (1995), acknowledging that "innovations in computer-assisted learning rarely have been evaluated in terms of their impact on the nature of the classroom learning environment as perceived by students" (p. 178), constructed the Geography Classroom Environment Inventory (GCEI). The GCEI has four scales: Gender Equity, Investigation, Innovation, and Resource Adequacy. With a sample of 671 high-school geography students in 24 classes in Singapore, the researchers used the actual version to compare computer-assisted learning classes and control classes which did not use computers. In addition, associations were established between classroom environment, achievement and attitudes.

Telli, den Brok, and Cakiroglu (2010) conducted a study in Turkey with a translated version of the QTI along with an attitude questionnaire (Fraser, 1981) to investigate associations between teacher–student interpersonal behavior and students' attitudes to science. The impressive sample consisted of 7,484 students in Grades 9, 10, and 11 from 278 classes in 55 public schools in 13 major cities. Multilevel analysis of variance revealed that the influence dimension of the QTI was related to student enjoyment, while proximity was associated with attitudes to inquiry.

Dorman and Fraser (2009) conducted a study among 4,146 high-school students from Western Australia and Tasmania to investigate classroom environment, antecedent variables, and student affective outcomes using the Technology-Rich Outcomes-Focused Learning Environment Inventory (TROFLEI). The student outcome

measures included attitude to the subject, attitude to computer use, and academic efficacy. Improving classroom environment was found to have the potential to improve student outcomes; antecedents did not have any significant direct effect on outcomes; and academic efficacy mediated the effect of numerous classroom environment dimensions on attitude to subject and attitude to computer use.

Haertel, Walberg, and Haertel (1981) conducted an impressive meta-analysis involving 734 correlations from 12 studies comprised of 823 classes, eight subject areas, 17,805 students, and four countries. Their meta-analysis revealed that learning posttest scores and regression-adjusted gains were consistently and strongly associated with cognitive and affective learning outcomes. Furthermore, better achievement on a variety of outcome measures was found consistently in classes perceived as having greater Cohesiveness, Satisfaction and Goal Direction and less Disorganization and Friction.

Fraser, Walberg, Welch, and Hattie (1987) confirmed Haertel et al.'s (1981) findings by providing further evidence supporting the link between educational environments and student outcomes. In their six-chapter summary of research on school- and classroom-level variables affecting achievement, titled "Synthesis of Educational Productivity Research", Fraser et al. (1987) synthesized the results of 134 meta-analyses based on 7,827 studies and 22,155 correlations. It was estimated that the collective sample involved 5–15 million students in kindergarten through college.

Furthermore, researchers in Asia have conducted a variety of studies of associations between student outcomes and students' perceptions of their classroom environments, including: Singapore (Chionh & Fraser, 2009; Goh & Fraser, 1998, 2000; Khoo & Fraser, 2008; Quek, Wong, & Fraser, 2005; Wong & Fraser, 1996), Taiwan (Aldridge & Fraser, 2000; Aldridge et al., 1999; Aldridge et al., 2000), Korea, (Fraser & Lee, 2009; Lee et al., 2003; Kim et al., 1999, 2000), Indonesia (Fraser, Aldridge, & Adolphe, 2010; Fraser, Aldridge, & Soerjaningsih, 2010; Margianti et al., 2001), Brunei Darussalam (Khine & Fisher, 2001, 2002; Majeed et al., 2002; Scott & Fisher, 2004), and India (Koul & Fisher, 2005).

Research has also been conducted on outcome–environment associations with more than one classroom environment questionnaire used in the same study. For example, in Singapore, the MCI and QTI were both used in a study involving achievement and attitudes (Goh & Fraser, 1998). The study revealed that it was useful to use the MCI and QTI together in research into outcome–environment associations for student achievement, but not for student attitudes.

2.5.2 Differences Between Student and Teacher Perceptions of Actual and Preferred Environment

Using the ICEQ, Fisher and Fraser (1983) conducted a study of the differences in perceptions between teachers and students in terms of their actual and preferred classroom environment. The study revealed that students preferred a more positive classroom environment than was actually present for all five environment dimensions (Personalization, Participation, Independence, Investigation, and Differentiation). The study also revealed that teachers perceived a more positive classroom environment than did their students in the same classroom on four of the five dimensions (Personalization, Participation, Investigation, and Differentiation).

The pattern of students' preference for a more positive classroom learning environment than the one perceived as being present has been confirmed in studies involving the WIHIC and QTI among high school students in Singapore (Chionh & Fraser, 2009; Wong & Fraser, 1996). Additionally, the WIHIC has been used to confirm the same pattern among college students in Indonesia (Margianti, Fraser, & Aldridge, 2001). This research supports patterns found in other studies that have been conducted in classrooms in Australia (Fraser, 1982; Fraser & McRobbie, 1995), the Netherlands (Wubbels, Brekelmans, & Hooymeyers, 1991), Singapore (Teh & Fraser, 1994; Wong & Fraser, 1996), and the United States (Moos, 1979).

2.5.3 Determinants of Classroom Environments

Fraser (1994) identified a number of determinants of the psychosocial learning environment that have been investigated in studies using classroom environment instruments. These determinants of classroom environments include personality, class size, grade level, subject matter, the nature of the school-level environment, the

type of school, and ethnic, linguistic, cultural, age, and sex differences. There are several noteworthy studies in which researchers have investigated these factors:

- Anderson and Walberg (1972) found that larger class sizes were associated with greater classroom formality and less cohesiveness.
- Fisher and Kent (1998) established associations between teacher personality and classroom environment.
- Khine and Fisher (2001, 2002) investigated cultural differences in students' classroom environment perceptions depending on whether the teacher was Asian or Western. The researchers found that students perceived a more favorable learning environment in the classrooms of the Western teachers and enjoyed their science lessons more than lessons taught by Asian teachers.
- Knight (1992) reported differences in the classroom environment perceptions of African–American and Hispanic students.
- Koul and Fisher (2005) assessed associations between students' cultural background and their perceptions of their teacher's interpersonal behavior and classroom learning environment. The researchers found that one group of students had more positive perceptions of their classroom environments and teacher interactions relative to students of other cultural groups identified in this study.
- Levy, Wubbels, Brekelmans, and Morganfield (1997) reported cultural differences based on place of birth and primary language spoken at home in student perceptions of teacher/student interaction.
- Owens and Straton (1980) investigated student preferences for individual types of classroom environments which included cooperative, competitive, and individualized environments. Their study revealed that female students preferred cooperative classroom environments more than male students, but that male students preferred both competitive and individualized learning environments more than female students.
- Quek et al. (2005) found significant sex differences in classroom environment perceptions, with the largest sex differences in actual perceptions of Material Environment.

Classroom environment instruments can also be used as process criteria in the evaluation of educational innovations (Fraser, 2007). For example, in an evaluation of the Australian Science Education Project (Fraser, 1979), students perceived their

classrooms as being more satisfying, individualized, and as having a better material environment when compared with a control group. This study, as well as an evaluation of Harvard Project Physics (Walberg & Anderson, 1968; Welch & Walberg, 1972), revealed that classroom environment variables differentiated between curricula despite the fact that there were little differences between curricula in student outcomes.

Numerous studies have substantiated the value of evaluating educational innovations using classroom learning environment criteria:

- As previously discussed in Section 2.4.8, Nix et al. (2005) used the CLES to evaluate the ISLE science teacher development program. The study assessed the types of school classroom environments created by teachers who had completed the ISLE program as perceived by 445 students in different 25 classes. The researchers constructed an innovative side-by-side response format for the CLES, enabling students to provide their perceptions of 1) their current class taught by the teacher who had completed the ISLE program and 2) other classes at the same school taught by different teachers who had not completed the ISLE program). The study indicated that students of teachers who participated in the ISLE professional development program perceived their classrooms as having significantly higher levels of the CLES scales of Personal Relevance and Uncertainty relative to the comparison classes.
- Also discussed in Section 2.4.7 was Lightburn and Fraser's (2007) study conducted in the United States (Florida) to evaluate the effectiveness of using anthropometric activities in high-school biology classes. Using the SLEI with a sample of 761 high-school biology students, the researchers found significantly higher scores on several SLEI and attitudinal scales.
- Martin-Dunlop and Fraser (2008) conducted a study at a large urban university in the United States (California) with a sample of 525 female students in 27 classes. The purpose of the study was to evaluate an innovative science course for prospective elementary teachers. The researchers administered learning environment scales from the WIHIC and SLEI. Large differences of over 1.5 standard deviations were found on all scales between students' perceptions of the innovative course and their previous courses.

- Wolf and Fraser (2008) used the WIHIC in the United States (New York) to assess the effectiveness of inquiry-based laboratory activities in terms of learning environment, attitudes, and achievement. The study's sample consisted of 1,434 middle-school students in 71 science classes. Results revealed that inquiry-based instruction promoted more Student Cohesiveness than non-inquiry instruction and that inquiry-based instruction was differentially effective for male and female students.
- Afari, Aldridge, Fraser, and Khine (2013) used an Arabic translation of the WIHIC with a sample of 352 college students from 33 classes in the United Arab Emirates. The purpose of the study was to determine how the use of mathematics games affected the learning environment. The researchers found that the use of games promoted a positive classroom environment.

2.5.4 Use of Qualitative Research Methods

Significant progress has been made in using qualitative methods in learning environments research and in combining qualitative and quantitative methods within the same study of classroom environments (Fraser & Tobin, 1991; Tobin & Fraser, 1998).

- Aldridge, Fraser, and Huang (1999) combined qualitative and quantitative methods in a noteworthy study conducted in Taiwan and Australia. By combining the WIHIC questionnaire with classroom observations and interviews with students and teachers, the researchers assembled narratives about what was taking place inside science classrooms in these two countries. The qualitative information complemented the quantitative information and clarified patterns within, and differences between, science classrooms in Australia and Taiwan.
- Tobin, Kahle, and Fraser (1990) conducted a study that focused on the goal of higher-level cognitive learning. Over a 10-week period, six researchers investigated students in two Grade 10 science classrooms in Australia. On a daily basis, the research team observed the classes in session, interviewed the students and two teachers, and reviewed students' written class assignments. Quantitative research was conducted by administering questionnaires assessing students' perceptions of their classroom psychosocial environment. This study revealed that students' perceptions were consistent with the

observers' field records of patterns of learning activities and engagement in each classroom.

- Fraser's (1999) multilevel study of the learning environment of a science class in Australia utilized a teacher–researcher perspective along with six university-based researchers. The qualitative components of this study involved researchers visiting the class over a five-week period, examining student diaries, conducting interviews, using video-recordings, taking field notes, and holding meetings. The quantitative component involved the use of a questionnaire that enabled the researcher to make comparisons between the observed teacher in the interpretative study and other teachers within the same school. Quantitative methods also were employed in assessing whether the school was typical of other schools within Western Australia.

Fraser (2002a) claimed that the use of quantitative methods to investigate learning environments has dominated research in Asia. Qualitative methods in Asian studies, however, have been used successfully in a minor way, as in interviews of small groups of students with the intention of checking the suitability of a learning environment questionnaire and modifying the instrument before using it in a large-scale study (Khine & Fisher, 2001; Margianti et al., 2001; Soerjaningsih, Fraser, & Aldridge, 2001a, 2001b). Lee and Fraser (2002) have opined that Asian researchers have only begun to demonstrate the benefits of combining qualitative and quantitative methods in learning environments research.

2.5.5 Cross-National Studies

Cross-national studies—research that crosses national boundaries—of learning environments offer a great deal of promise for generating new insights for two significant reasons:

- There usually is greater variation of interest (e.g., teaching methods and student attitudes).
- The 'taken-for-granted' familiar educational practices, beliefs, and attitudes in one country can be exposed, questioned, and interpreted as foreign or 'strange' when research involves two countries (Fraser, 1997, 2012).

Cross-national studies are important for understanding classroom environments in various countries. When conducting cross-national studies, researchers might adopt

an interpretive approach that enables them to merge data collected from multiple paradigms and research methods, thereby enabling them to inspect components that could be influenced by culture. These components, which might otherwise be overlooked, include "situational and contextual factors,… [such as] social expectations, norms, task definitions and social cues" (Maehr & Nicholls, 1980, p. 8).

Cross-national studies encourage researchers to identify the qualities inherent in each country that they are investigating. Through these types of comparisons, researchers can provide understanding of concepts as viewed by those individuals under review, thus spawning new insights (Brislin, 1983; Fraser, 1997; Stigler & Hiebert, 1997). Such studies also accept the inclusion of the social context in which behaviors occur (Bilmes & Boggs, 1979; Tseng & Hsu, 1979). "Comparative studies of this nature enable researchers, teachers, and teacher educators to gain better understandings about their own beliefs and social and cultural restraints to their teaching" (Aldridge et al., 1999, p. 60).

Aldridge et al. (1999) reported a cross-national learning environment study involving six Australian and seven Taiwanese researchers who collaborated in administering the WIHIC to a total of 50 junior high-school science classes in two countries. The sample consisted of 1,879 students in Taiwan and 1,081 students in Australia. The WIHIC was translated into Mandarin Chinese and then translated back into English by team members who were not involved in the questionnaire's original translation. Involvement and Equity scales had the largest differences in means between the two countries, with Australian students perceiving each scale more positively than students from Taiwan. To complement the quantitative data, qualitative methods (interviews and observations) were used in order to explain reasons for patterns and differences between countries and to highlight the need for caution when interpreting differences between questionnaire results from two countries with cultural differences (Aldridge & Fraser, 2000).

Fraser, Aldridge, and Adolphe (2010) conducted a cross-national study of classroom environments in Australia and Indonesia with a sample of 1,161 students (594 students from 18 classes in Indonesia and 567 students from 18 classes in Australia). A modified version of the WIHIC questionnaire was used simultaneously in these two

countries to cross-validate the instrument, investigate differences between countries and sexes in perceptions of classroom environment, and investigate associations between students' attitudes to science and their perceptions of classroom environment. The study validated the modified WIHIC structure and revealed differences between countries and between sexes in students' perceptions of their classroom environments. Analyses revealed generally positive associations between the classroom environment and student attitudes to science in both countries.

2.6 What Is Happening In this Class? (WIHIC) Questionnaire

The present study used the WIHIC questionnaire, developed by Fraser et al. (1996), to assess learning environments. The questionnaire combines modified versions of the most salient scales from a vast range of existing questionnaires with additional scales that address contemporary educational concerns, thereby establishing parsimony in the field of learning environments. The WIHIC measures a wide range of dimensions that are important to the current situation in classrooms. The instrument is capable of measuring students' perceptions of their learning environments and has demonstrated predictive validity for both cognitive and affective student outcomes (Fraser, 2002b). Lastly, and perhaps most appealing to researchers, the final version of the WIHIC has a limited number of items (56 in total) and scales (7 in total), making the instrument easy and economical to use in classrooms.

The WIHIC has become the most-frequently used classroom instrument around the world (Fraser, 2012) and "has achieved almost bandwagon status in the assessment of learning environments" (Dorman, 2008, p. 181). Section 2.6 is devoted to presenting a detailed review of the WIHIC, including the instrument's conceptualization and development (Section 2.6.1) and a review of noteworthy past studies that have successfully employed and validated this instrument (Section 2.6.2).

2.6.1 Conceptualization and Development of the WIHIC

Fraser et al. (1996) refined the original 90-item nine-scale version of the WIHIC by statistical analysis of data gathered from 355 junior high-school science students and by conducting extensive interviews with students about their overall views pertaining to their classroom learning environments, the wording of individual questionnaire

items, and students' responses to these items. Following the revision process, 54 items in seven scales remained. The WIHIC was later expanded to 80 items in eight scales and field-tested with junior high-school science classes in Australia and Taiwan. The Australian sample consisted of 1,081 students in 50 classes and used the original English version of the WIHIC. The Taiwanese sample consisted of 1,879 students in 50 classes and used a carefully-translated Mandarin Chinese version (that also underwent back translation) of the WIHIC (Huang, Aldridge, & Fraser, 1998). Based on the results of the field-testing, the WIHIC was again modified to its current and final 56-item version (eight items in each of seven scales) described by Aldridge, Fraser, and Huang (1999). The seven scales are Student Cohesiveness, Teacher Support, Involvement, Investigation, Task Orientation, Cooperation, and Equity. In order to respond to the items in each scale, the WIHIC asks student respondents to indicate how often a practice occurs using the five-point frequency response scale of Almost Never, Seldom, Sometimes, Often, and Almost Always. Aldridge and Fraser (2000) found strong factorial validity (factor analysis supported the five-scale structure in that the items formed independent measures of the psychosocial learning environment), sound internal consistency reliability, and that each scale was capable of differing significantly between the perceptions of students in different classrooms.

The WIHIC's items are arranged consecutively in blocks rather than randomly or cyclically. The scales are ordered in such a manner that familiar items appear first and the individual items are worded and phrased in first-person pronoun form. Moreover, the WIHIC exclusively uses positive items; there are no negative items included in the survey to avoid confusion among respondents.

Given that the WIHIC can be administered in two forms—a Class form or a Personal form—the tool can be used to assess either a student's perceptions of his or her class as a whole or assess a student's individual perceptions of his or her role in a classroom (Fraser, 1999). The personal form uses the same scales and comparable items as in the class form, though the questionnaire is structured to elicit the student's perceptions of his or her individual role within the classroom, rather than the student's perceptions of the class as a whole (Fraser, 1998a, 1998b; Fraser et al., 1996).

TABLE 2.2 Description and Sample Item for Each WIHIC Scale

Scale	Description	Sample Item
Student Cohesiveness	Extent to which students know, help and are friendly toward each other	I know other students in this class.
Teacher Support	Extent to which the teacher is interested in the students, while displaying characteristics of helpfulness, trustfulness, friendliness, etc.	The teacher takes a personal interest in me.
Involvement	Extent to which students are involved and participate in science class	I explain my ideas to other students.
Investigation	Extent to which there is an emphasis on inquiry learning and problem solving	I carry out investigations to test my ideas.
Task Orientation	Extent to which students complete activities and stay on subject matter	I pay attention in this class.
Cooperation	Extent to which students cooperate rather than compete with one another on learning tasks	I work with other students in this class.
Equity	Extent to which students are treated equally	I am treated the same as other students in this class.

Note. Adapted from Koul and Fisher (2005).

Table 2.2 provides a description and sample item for each scale of the WIHIC questionnaire.

2.6.2 Past Studies that Employed the WIHIC

In recent years, the WIHIC has been used to investigate classroom learning environments in different subject areas, with different age groups, and in different countries (Aldridge & Fraser, 2000). The WIHIC has been validated in various subject areas throughout different countries, including: science in Australia, Brunei Darussalam, Canada, New Zealand, South Africa, Taiwan, Turkey, and the United States (Aldridge & Fraser, 2000; Aldridge, Fraser, & Huang, 1999; Aldridge, Laugksch, Seopa, & Fraser, 2006; Cakiroglu et al., 2009; Saunders & Fisher, 2006), mathematics in Indonesia (Margianti, Aldridge, & Fraser, 2004), and geography and mathematics in Singapore (Chionh & Fraser, 2009). Hence, a review of past studies that have employed the WIHIC are discussed in the following subsections: Validation of the WIHIC Cross-Nationally and in Australia (Subsection 2.6.2.1); Validation of

the WIHIC in the United States (Subsection 2.6.2.2); Validation of the WIHIC in Asia (Subsection 2.6.2.3); and Validation of the WIHIC in South Africa (Subsection 2.6.2.4).

2.6.2.1 Validation of the WIHIC Cross-Nationally and in Australia

The importance and benefits of conducting cross-national studies were previously discussed in Section 2.5.5. The WIHIC has been cross-nationally validated by numerous researchers in various countries and languages.

In an impressive cross-national study involving a sample of 3,980 high-school students in Grades 8, 10, and 12 from Australia, Canada, and the United Kingdom, Dorman (2003) validated the WIHIC using confirmatory factor analysis. The analysis supported the instrument's seven-scale *a priori* structure (coefficient alphas ranged from 0.76 to 0.85). While it was found that some scales overlapped, in was not to such an extent that the psychometric structure of the instrument was violated. Through multisample analyses within structure equation modeling, invariant factor structures for three grouping variables—country, grade level, and gender—were substantiated. Dorman's study justifies the wide international applicability of this instrument to accurately measure classroom psychosocial environment.

Dorman (2008) later conducted a second study of the WIHIC with a sample of 978 secondary-school students in Australia. This study used both the actual and preferred forms of the questionnaire. Separate confirmatory factor analyses for the actual and preferred forms supported the instrument's seven-scale *a priori* structure. Through multitrait–multimethod modeling (using the seven scales as traits, and the actual and preferred forms of the instrument as methods), construct validity was supported.

Several other noteworthy cross-national studies have confirmed the WIHIC's reliability, validity, and usefulness in research:

- Aldridge and Fraser (2000) investigated classrooms in Australia and Taiwan using both English-language and Mandarin-language versions of the WIHIC. The Mandarin version underwent a back-translation process to achieve linguistic equivalence with the English version. The English and Mandarin versions of the WIHIC were then administered to a sample of 1,081 junior

high students in 50 classes in Australia and 1,879 junior high students in 50 classes in Taiwan. The data collected were analyzed to confirm the reliability and validity of the questionnaire in each country. Additionally, when differences and similarities between students' perceptions in each country were analyzed, students in Australia consistently viewed their classroom environments more positively than did students in Taiwan for Involvement, Investigation, Task Orientation, Cooperation, and Equity. Students in Australia perceived that they were given more opportunity to become involved in classroom experiments. The researchers also found the education system in Taiwan to be more examination-driven, compared to the more collaborative-natured approach in Australia. It was also found that, in Taiwan, the most important element of being a 'good teacher' was based on possessing content knowledge. In Australia, however, having good interpersonal relationships between teachers and their students was considered the most important element. Perhaps of utmost significance, this study underlined the importance of cross-national studies for helping researchers to understand not only the importance of other countries, but also the importance of the researcher's own country.

- Fraser, Aldridge, and Adolphe (2010) conducted a study with a modified version of the WIHIC simultaneously in both Indonesia and Australia with a sample of 1,161 secondary students (594 students from 18 classes in Indonesia and 567 students from 18 classes in Australia). Analyses supported the validity of a revised structure for the WIHIC and revealed differences between countries and gender differences in students' perceptions of their classroom learning environments. The researchers also found that, in both countries, generally there were positive associations between the classroom environment and student attitudes to science.
- Zandvliet and Fraser (2004, 2005) provided cross-national validation of the WIHIC using a sample of 1,404 students in Grades 10, 11, and 12 in 81 senior high school information technology classrooms throughout Australia and Western Canada. The study focused on how network computer workstations were physically implemented and how these stations impacted on and interacted with student satisfaction. The researchers used a combination of quantitative and qualitative approaches in the data collection process. Five

scales of the WIHIC were used (Student Cohesiveness, Involvement, Autonomy/Independence, Task Orientation, and Cooperation). The researchers found that the Internet in both countries was predominately used to assist with projects, research, and individual assignments. Students and teachers were mostly positive about their learning environments, though concerns were expressed regarding classroom layouts, workstation heights, room temperatures, and air quality. The study also revealed that Canadian classrooms exhibited slightly more student–teacher interactions than Australian classrooms. Both Canadians and Australians perceived the level of Autonomy/Independence as low. The mean scale scores were comparable for the two countries except that both Involvement and Satisfaction were higher with the Australian sample. Stronger associations were found between Satisfaction and the learning environment scales than between Satisfaction and the physical environment measures.

2.6.2.2 Validation of the WIHIC in the United States

Several noteworthy studies in the United States have confirmed the WIHIC's reliability, validity, and usefulness in research:

- den Brok, Fisher, Rickards, and Bull (2006) conducted a study with a sample of 665 middle-school students from 11 different schools in California. This study supported the validity and usefulness of the WIHIC for this population.
- Martin-Dunlop and Fraser (2008) conducted a study with a sample of 525 female students from 27 classes at a large urban university in California. The study used the WIHIC to evaluate the effectiveness of an innovative course aimed at improving elementary teachers' perceptions towards laboratory-based learning environments.
- Ogbuehi and Fraser (2007) used a modified version of the WIHIC with a sample of 661 middle-school mathematics students from 22 classrooms in four inner city schools in California. Analyses supported the factor structure, internal consistency reliability, and discriminant validity of the WIHIC.
- Allen and Fraser (2007) used modified versions of the WIHIC, in both English and Spanish, with a sample of young students and their parents in Florida. The researchers administered the questionnaire to 520 students in Grades 4

and 5, and to 120 parents of these students. The study found that actual–preferred differences were larger for parents than students.

- Helding and Fraser (2013) conducted a study with a sample of 924 students in 38 Grade 8 and Grade 10 science classes in Florida. Slightly modified versions of the WIHIC (as a result of respondent word preferences), in both English and Spanish, were used to evaluate the effectiveness of National Board Certified (NBC) teachers in terms of their students' perceptions of classroom environment. Students of NBC teachers had more favorable classroom environment perceptions than students of non-NBC teachers.
- Pickett and Fraser (2009) conducted a study with a sample of 573 elementary school students in Grades 3, 4, and 5 in Florida. The study evaluated a monitoring program for beginning teachers in terms of changes in learning environment in teachers' classrooms. Sound factorial validity for the WIHIC was found.
- Robinson and Fraser (2013) conducted a study with a sample of 172 kindergarten students and 72 parents in Florida using both English and Spanish versions of the WIHIC. Relative to students, parents perceived a more favorable classroom environment but preferred a less favorable environment.
- Wolf and Fraser (2008) administered the WIHIC to 1,434 middle-school students in 71 classes in New York. The study found that inquiry-based laboratory activities promoted cohesiveness and were differentially effective for males and females. Analyses confirmed the WIHIC's reliability and validity.

2.6.2.3 Validation of the WIHIC in Asia

There have also been numerous noteworthy studies conducted in Asia that have confirmed the WIHIC's reliability, validity, and usefulness in research. In several studies, the WIHIC was modified for use in the Asian or Middle Eastern context and carefully translated from English into different languages, including: Arabic (MacLeod & Fraser, 2010; Afari et al., 2013); Indonesian (Fraser, Aldridge, & Adolphe, 2010; Wahyudi & Treagust, 2004); Korean (Kim et al., 2000); and Mandarin Chinese (Aldridge et al., 1999; Aldridge and Fraser, 2000). The aforementioned studies conducted throughout Asia confirm that the WIHIC can be

modified and translated into several different languages and still remain a reliable and valid instrument. The following studies have made significant contributions to the WIHIC's success in Asia:

- Chionh and Fraser (2009) conducted a large-scale study in Singapore into the validity and reliability of a modified English version of the WIHIC. For a sample of 2,310 students in 75 Grade 10 geography and mathematics classes, all scales of the modified English version of the WIHIC exhibited adequate factorial validity, internal consistency, and the ability to differentiate significantly between the perceptions of students in different classes. The study established associations between WIHIC scales and three student outcomes of examination results, attitudes, and self-esteem. In particular, better examination scores were found in geography and mathematics classrooms in which students perceived their environments as more cohesive, whereas students' self-esteem and attitudes were more favorable in classrooms perceived as having a greater amount of Teacher Support, Task Orientation, and Equity. Furthermore, this study replicated findings of the pattern in past research (Fisher & Fraser, 1983; Fraser, 1982; Fraser & McRobbie, 1995; Moos, 1979; Teh & Fraser, 1994; Wong & Fraser, 1996; Wubbels et al., 1991) in which students prefer a more positive classroom learning environment than the one perceived as being currently present.
- Khoo and Fraser (2008) conducted a study in Singapore with a sample of 250 adults attending computer application courses in 23 classes in four computer schools. Students perceived their classrooms to be relatively high for the scales of Involvement, Teacher Support, Task Orientation, and Equity, but the computer courses under investigation were differentially effective for students of different genders and ages. The study also established links between student satisfaction and dimensions of the WIHIC.
- Koul and Fisher (2005) conducted a study using the WIHIC in India with a sample of 1,021 students from 31 classes in seven co-educational private schools. Statistical analyses showed that the Kashmiri group of students perceived their classrooms and teacher interaction more positively than those from the other cultural groups identified in the study.
- Kim et al. (2000) conducted a study in Korea involving 543 Grade 8 science students in 12 schools who were administered a Korean-language version of

the WIHIC that underwent a back-translation process to achieve linguistic equivalence with the English version. The study explored gender-related differences in students' perceptions of their learning environment and teacher behavior. Data analyses revealed statistically significant differences between boys and girls on all seven scales, with boys perceiving more Teacher Support, Involvement, Investigation, Task Orientation, and Equity than girls. Additionally, it was found that students reported a minimal amount of involvement in their classes, as well as a limited amount of cooperation with other students. Furthermore, the study revealed outcome–environment associations for attitudes and supported the validity of the Korean-language version of the WIHIC.

- Wahyudi and Treagust (2004) conducted a study using an Indonesian-language version of the WIHIC with 1,400 lower-secondary science students in 16 schools. Data analyses revealed that students tended to prefer more favorable classroom learning environments than they actually perceive, with female students holding slightly more positive perceptions for both the actual and preferred learning environment. Additionally, urban students perceived greater cooperation and less teacher support than suburban students.
- Cakiroglu et al. (2009) conducted a study in Bursa, Turkey with a sample of 1,474 students in Grades 9, 10, and 11 from 52 classes at four schools. Eleven biology teachers also participated in the study. The WIHIC was used to investigate interactions between gender and grade levels with respect to students' perceptions of their actual learning environments in biology classes. The researchers reported statistically significant gender and grade level differences. Notably, girls perceived their biology classrooms as being more task-oriented and as having greater teacher support and equity than did boys.
- MacLeod and Fraser (2010) administered an Arabic version of the WIHIC to 763 college students in 82 classes in the United Arab Emirates. Data analyses confirmed sound validity and internal consistency for both the actual and preferred forms for both languages.
- Afari et al. (2013) also verified the validity of an Arabic version of the WIHIC in the United Arab Emirates with 352 college students in 33 classes.

2.6.2.4 Validation of the WIHIC in South Africa

The WIHIC has also been validated successfully in South Africa by Aldridge, Fraser, and Ntuli (2009) with a sample of 1,077 students in Grades 4–7 assigned to 31 primary distance-education teachers. The results benefited pre-service teachers undertaking a distance-education program by providing feedback about discrepancies between learners' actual and preferred learning environments—with the objective of improving teaching practices.

The results of the aforementioned studies complement additional past research that has reported that the scales of the original, modified, and/or translated versions of the WIHIC exhibit sound factorial validity and internal consistency reliability. Additionally, the majority of the studies discussed in this section provide evidence of the WIHIC's ability to differentiate significantly between the perceptions of students in different classrooms.

2.7 Student Attitudes

In addition to investigating student perceptions of classroom learning environment, the present study also investigated student attitudes using the new SALES questionnaire developed by Velayutham et al. (2011). Thus, a review of literature on the field of attitudes is provided in this section. Section 2.7.1 defines the often abstractly characterized term 'attitude'. Section 2.7.2 provides a brief overview of the methods available to researchers for assessing attitudes. Section 2.7.3 explores the theoretical foundations of adaptive motivation (i.e. learning goal orientation, task value and self-efficacy) and self-regulated learning environments. Section 2.7.4 highlights the significant contributions of the Test of Science-Related Attitudes (TOSRA).

2.7.1 Defining 'Attitude'

Thurstone (1928) is credited with first declaring that "attitudes can be measured" (Gawronski & LeBel, 2008). In his widely acclaimed article, published in the *American Journal of Sociology*, Thurstone wrote:

> Attitude denotes the sum-total of a man's inclinations and feelings, prejudice and bias, preconceived notions, ideas, fears, threats and convictions about any

> specific topic. Thus a man's attitude about pacifism means here all that he feels and thinks about peace and war. It is admittedly a subjective and personal affair. (p. 531)

In more recent years, researchers have attempted to expand upon and clarify Thurstone's definition. Baron and Byrne (1977), for example, described attitudes as individually-attributed beliefs, emotions, and behavioral tendencies that an individual has towards specific abstract or concrete objects. Kerlinger (1986) defined an attitude as "…an organized predisposition to think, feel, perceive, and behave toward a referent or cognitive object" (p. 453). Attitudes have also been defined as positive or negative emotional dispositions (Aiken, 2000; McLeod, 1992). For the purposes of the present study, in an effort to arrive at a definition easily comprehensible to middle-schoolers, a slightly modified version of Baron and Byrne's (1997) definition was adopted.

2.7.2 Assessing Attitudes

Attitudes have been found to be one of the main determinants of human behavior (Tavşancil, 2006). Mueller (1986) proffered that, because attitudes cannot be observed or measured directly, their existence must be inferred from their consequences. Stodolsky at al. (1991) claimed that even if an individual forgets specific information, attitudes and tendencies towards the forgotten information would be remembered.

To assess attitudes, both qualitative and quantitative methods can been employed. However, the most prevalent method for the assessment of attitudes has been the use of attitudinal scales, such as the Bogardus social distance scale, Guttman scale, Likert-type attitudinal scale, Osgood's semantic differential scale, and Thurstone scale (Tavşancil, 2006). However, the Likert-type attitudinal scale is the most widely used method of scaling in the social sciences (Tittle & Hill, 1967).

Likert (1932) developed the principle of measuring attitudes using frequency scales with fixed choice response formats (Bowling, 1997; Burns & Grove, 1997). Respondents are asked to specify their level of agreement or disagreement on a symmetric agree–disagree scale for a series of statements, thereby tapping into the cognitive and affective components of attitudes. The SALES, the instrument employed in the present study, was constructed with Likert-type attitudinal scales.

2.7.3 Adaptive Motivation and Self-Regulated Learning Environment

Whereas attitudes are affective responses that accompany a behavior initiated by a motivational state (Guthrie & Knowles, 2001), Schunk (2004) described motivation as the internal circumstance that instigates and focuses goal-oriented behavior. Motivation is a key dimension of attitudes (Tapia & Marsh, 2004). Theobald (2006) stressed that stimulating students' motivation to learn remains one of the greatest challenges for teachers.

The present study focused on attitudes concerning students' adaptive motivated and self-regulated learning engagement. The term 'adaptive' is commonly used in educational psychology to describe characteristics that promote students' engagement in learning (Ames, 1992; Kaplan & Maehr, 2007; Midgley, 2002; Pintrich, 2000).

Zimmerman (2002) reported that three components of motivation have consistently been associated with students' adaptive motivational beliefs—learning goal orientation, task value, and self-efficacy—and that each is integral to successful engagement in self-regulated learning. Pintrich (2000) asserted that both adaptive motivational beliefs and adaptive self-regulated learning are fundamental to students' engagement in classroom tasks. Hence, these components, as well as the theoretical underpinnings of self-regulated learning, are discussed in the following subsections: Learning Goal Orientation (Subsection 2.7.3.1); Task Value (Subsection 2.7.3.2); Self-Efficacy (Subsection 2.7.3.3); and Self-Regulation (Subsection 2.7.3.4).

2.7.3.1 Learning Goal Orientation

Goal orientation provides important theoretical perspectives to assist in understanding the reasons for students' engagement in a task (Pintrich, 2000). Learning goal orientation focuses on learning, understanding, and mastering tasks (Ames, 1992). Students' learning goal orientation is likely to influence a range of positive learning outcomes, including student achievement (Brookhart, Walsh, & Zientarski, 2006; Kaplan & Maehr, 1999, 2007). Goal orientation has also been found to have a significant influence on students' attitudes toward science and science achievement (Tuan, Chin, & Shieh, 2005).

2.7.3.2 Task Value

Wolters and Rosenthal (2000) asserted that students who are convinced that their learning activity is important, interesting, and useful are prone to spend more effort and persist longer towards completing an activity. According to Schunk and Zimmerman (2007), even when lacking self-efficacy, students are inclined to commence and sustain their efforts if they value the learning activity. Task value is strongly associated with cognitive and self-regulatory strategies; students are more cognitively engaged when they believe that their learning activity is interesting and important (Pintrich & De Groot, 1990; Wolters, Yu, & Pintrich, 1996). Tuan et al. (2005) found that task value significantly influences students' attitudes toward science and science achievement.

2.7.3.3 Self-Efficacy

Bandura (1977), in establishing the social cognitive theory, defined self-efficacy as the measure of one's own ability to complete tasks and reach goals. Social cognitive theory maintains that students are more likely to have incentive to learn if they believe that they can produce the desired outcomes (Bandura, 1986). Pajares (2002) suggested that self-efficacy is closely related to students' self-regulated learning. Schunk and Pajeres (2005) asserted that students with high efficacy are more likely to apply a greater amount of effort, consistently assess their progress, and use self-regulatory strategies. Past research suggests that self-efficacy:

- leads students to better future performance (Britner & Pajares, 2006);
- serves as a predictor of academic achievement (Andrew, 1998; Lent, Brown, & Larkin, 1986); and
- serves as a predictor of persistence in science-related majors and career choices (Gwilliam & Betz, 2001; Lent, Brown, & Larkin, 1984; Lent et al., 1986; Luzzo, Hasper, Albert, Bibby, & Martinelli, 1999).

2.7.3.4 Self-Regulation

The degree to which students metacognitively, motivationally, and behaviorally participate in the learning process is known as self-regulation (Zimmerman, 2008). In order to achieve learning goals, self-regulated learners steer and direct their cognitive and motivation processes. In addition to being motivated through assigning goals and values to the learning activity, students must also sustain their effort until completion

of the task (Boekaerts & Cascallar, 2006). Zimmerman (2008) argued that there are three core requirements of the self-regulated learner: personal initiative, perseverance, and adaptive skills. Pintrich (2003) found that students with higher self-regulation skills are more likely to be academically motivated. Perels, Gurtler, and Schmitz (2005) found that interventions intended to improve students' self-regulated learning, even those relatively short in length, are capable of producing sustained benefits, such as raising students' self-efficacy beliefs.

There are two questionnaires that have been developed to assess student self-regulated learning among college students. The Learning and Study Strategies Inventory (LASSI), developed by Weinstein, Schulte, and Palmer (1987), is a 10-scale, 80-item assessment of students' learning and study strategies related to skill, will and self-regulation components of strategic learning. The LASSI provides students with a diagnosis of their strengths and weaknesses, compared to other college students. The instrument serves as a diagnostic tool with the purpose of enabling students to strengthen weaknesses through interventions. Despite the widespread use of the LASSI by over 2,000 tertiary institutions (H & H Publishing, 2011), the weight of research pertaining to the ability of the LASSI to accurately assess student achievement is mixed (Hulick & Higginson, 1989; Prus, Hatcher, Hope, & Grabiel, 1995).

The Motivated Strategies for Learning Questionnaire (MSLQ), developed by Pintrich et al. (1991), is an 81-item, self-report instrument consisting of six motivation subscales and nine learning strategies scales. The polarity of many of the items is negative. The MSLQ has been used among college students to assess their motivational orientations and use of learning strategies in different types of content areas (Bong, 2001; Liu, 2003; Wolters, 2004). The instrument has also been used to evaluate the motivational and cognitive effects of different aspects of college instruction (Barise, 2000). The MSLQ has undergone formal assessment of validity and reliability in several languages, including Spanish and Chinese (Duncan & McKeachie, 2005).

Therefore, attitudes can be linked directly to motivation and provide key information for a better understanding of attitudinal and motivational processes (De Lourdes Mata, Monteiro, & Peixoto, 2012).

2.7.4 Test of Science-Related Attitudes

Given that the SALES, the instrument used in the present study, was originally developed in order to measure salient factors related to the motivation and self-regulation of students in lower secondary science classrooms, it is also important to acknowledge the contributions of the Test of Science-Related Attitudes (TOSRA; Fraser, 1981), an instrument that helped pave the way for measuring attitudes related to science and science education.

Fraser (1978), noting three potential problems with several existing instruments frequently used to assess attitudes towards science (low statistical reliability, a lack of economy of items, and the combination of distinct attitude concepts into a single scale which creates a mixture of variables), developed the TOSRA to overcome many of the prevalent shortcomings. The TOSRA measures seven distinct and wide-ranging categories of attitudes toward science among secondary school students: Social Implications of Science, Attitude to Scientific Inquiry, Adoption of Scientific Attitudes, Enjoyment of Science Lesson, Leisure Interest in Science, Career Interest in Science, and Normality of Scientists. The original TOSRA has 70 statements (10 items in each of 7 scales), which are directly aligned with the theoretical structure of Klopfer's (1971) early work. Klopfer notably categorized the following affective behaviors in science education:

- manifestation of favorable attitudes towards science and scientists
- acceptance of scientific enquiry as a way of though
- adoption of 'scientific attitudes'
- enjoyment of science learning experiences
- development of interests in science and science-related activities
- development of an interest in pursuing a career in science or science related work.

The TOSRA employs a five-point Likert scale with responses ranging from Strongly Agree to Strongly Disagree. Each scale's polarization is balanced; scales are comprised of five positive items and five negative items.

The TOSRA was field tested in Australia with a sample consisting of 1,337 students in 44 classes from 11 different schools (Fraser, 1981). Several studies have cross-validated the TOSRA, confirming the instrument's validity and reliability, in Australia (Fraser, Aldridge, & Adolphe, 2010; Fraser & Butts, 1982; Schibeci & McGaw, 1981), the United States (Lightburn & Fraser, 2007; Pickett & Fraser, 2002), Singapore (Wong & Fraser, 1996), and Indonesia (Fraser, Aldridge, & Adolphe, 2010). These studies reported good validity and reliability for the TOSRA.

2.8 Sex Differences

In addition to investigating learning environment and attitudinal differences between gifted and non-gifted students, the present study also investigated sex differences among these populations. Therefore, this section provides a literature review on the topic of sex differences related to gifted education and learning environments.

Clark (2002) attributed the fundamental differences between male and female behavior to basic brain development, concluding that male and female brains differ in anatomy and biochemistry. Her research supports the premise that the environment in which a brain operates determines, in large part, its functionality. Research has also established that interactions with the environment stimulate dendritic growth (Caine & Caine, 1991; Diamond, 1967; Jensen, 1998), creating new neural pathways.

On the whole, females are more efficient than males in the development of their brain's left hemispheres, providing an advantage over males in verbal functions and tasks which require organizing data in sequence (Jensen, 1998). Females develop a greater aptitude in terms of language, both verbal and written. Males, on the other hand, specialize in right-hemisphere visual functions which aid the comprehension of spatial relationships associated with mathematics (Clark, 2002).

Section 2.8.1 reviews literature pertaining to sex differences among gifted and non-gifted students. Section 2.8.2 presents literature on sex differences conducted in the field of learning environments.

2.8.1 Sex Differences Among Gifted and Non-Gifted Students

In *Expert Approaches to Support Gifted Learners*, published in collaboration with the California Association for the Gifted, Clark (2002) asserted that "enriching environmental simulation can change brain patterns, thereby mitigating many of the disadvantages established by the response to anatomical and hormonal predispositions" (p. 39). It has been found that gifted students show evidence of a brain integration process that is more developed than for non-gifted students. "Because of increased stimulation, there is an increase in the production of neural cell growth, both biochemical and physical, allowing accelerated processing and more complex patterns of thought" (Clark, 2002, p. 41).

There has also been a great deal of research conducted on sex differences and stereotypes among both gifted and non-gifted students. Generally speaking, females often show their giftedness at an earlier age than males (Silverman, 1986). Kelly and Colangelo (1984) found that gifted females were not superior to average, non-gifted females in academic or social self-concept; however, gifted males were superior to non-gifted males in these characteristics. Kerr, Colangelo, and Gaeth (1988) found that gifted females, more so than gifted males, were concerned with the impact that their giftedness has on the attitudes of their peers. Their research also revealed that, while gifted males were likely to see some social advantages to being gifted, gifted females saw fewer advantages.

Research also supports that self-concept differences exist among gifted students of different genders (Hoge & McSheffrey, 1991; Li, 1988). Overall, however, gifted students are as vulnerable as their non-gifted peers to social and emotional problems during childhood and adolescence (Pfeiffer & Stocking, 2000).

Swiatek and Lupkowski-Shoplik (2000) researched attitudinal differences in gifted elementary school students, finding that males preferred science and technology, while females favored English, writing, foreign language, and reading. Siegle and

Reis (1994) found that adolescent female gifted students indicated that they had higher ability than males in language arts, while male gifted students indicated that they had higher ability than females in mathematics, science, and social studies. Grossman and Grossman (1994) found that males preferred learning environments that involved working independently, actively manipulating materials, and using numbers, logic, and computers.

Benbow (1992) reported that fewer females than males were labeled as mathematically gifted. The study also suggested that female students labeled as gifted were less likely to take demanding high school mathematics and science courses, major in mathematics or science in college, or pursue a career in a mathematics-related or science-related field. Woodard (2004) found that females display more mathematics anxiety than males in secondary school and college. Piirto (1991) concluded that young gifted females tend to develop more positive attitudes about mathematics and science when they have a role model with whom to identify at an early age. Fennema, Peterson, Carpenter, and Lubinski (1990) found that teachers' behavior often contributes to the presence of gender differences. Some evidence exists to support that the amount of teacher attention given to girls is lowest in science classes (Handley & Morse, 1984; Jones & Wheatley, 1990).

2.8.2 Sex Differences Related to Learning Environments

It is important to recognize that educational researchers have also investigated sex-related differences in perceptions of classroom learning environments (Majeed, Fraser, & Aldridge, 2002; Teh & Fraser, 1994; Wahyudi & Treagust, 2004; Wong & Fraser, 1997). Overall, studies have shown that females generally hold more favorable perceptions of their classroom learning environments than males in the same classes (Fraser, 2002b).

Wahyudi and Treagust (2004) researched sex differences in students' perceptions of their classroom learning environment and found that female students generally held slightly more positive perceptions of both actual and preferred learning environments. Their results replicated and expounded upon previous research (Fraser, Giddings, & McRobbie, 1995; Goh & Fraser, 1996; Henderson, Fisher, & Fraser, 2000; Lawrenz,

1987; Wong & Fraser, 1997) in which females held more favorable perceptions of their classroom learning environment than did their male counterparts.

Owens and Straton (1980) found that female students preferred cooperation more than male students; conversely, male students preferred competition and individualization more than their female counterparts. Moreover, Fisher et al. (1997) found that female students tend to perceive their teachers more positively than male students.

Speering and Rennie (1996) found that some secondary school subjects, the sciences in particular, are often perceived negatively by female students. As females grow older, they become less interested in science than males of the same age (Catsambis, 1995; Shymansky & Kyle, 1988; Simpson & Oliver, 1990; Weinburgh, 1995). Research further supports that female students typically have higher expectations of their science classroom learning environments than their male counterparts (Lawrenz, 1987; Wong & Fraser, 1995). Moreover, it has been argued that, of all academic subjects, the greatest inequity between sexes in participation, achievement, and attitudes is probably science (Baker, 1998; Parker, Rennie, & Fraser, 1996; Young & Fraser, 1994). However, it is important to note that, even with evidence that sex differences exist in attitudes toward science, the process of how these attitudes affect science outcomes remains largely unclear (Simpson & Oliver, 1990; Weinburgh, 1995; Wilson, 1983).

Research on sex differences in classroom learning environment perceptions has been conducted in various countries, including: Australia (Fisher, Fraser, & Rickards, 1997; Henderson, Fisher, & Fraser, 2000); Australia and Indonesia (Fraser, Aldridge, and Adolphe, 2010; Brunei Darussalam (Khine & Fisher, 2001, 2002; Majeed, Fraser, & Aldridge, 2002), Korea (Kim et al., 2000), Indonesia (Margianti et al., 2001), Singapore (Chionh & Fraser, 2009; Goh & Fraser, 1998; Khoo & Fraser, 2008; Quek et al., 2005; Wong & Fraser, 1996, 1997), Turkey (Cakiroglu, den Brok, Tekkaya, & Telli, 2009), and the United States (den Brok et al., 2006; Waxman & Huang, 1998; Wolf & Fraser, 2008).

Perhaps the most impressive study of sex differences in classroom learning environment perceptions was conducted throughout six different countries by Fraser,

Giddings, and McRobbie (1995), who field tested and validated the SLEI simultaneously in the United States, Canada, England, Israel, Australia, and Nigeria. (The SLEI was discussed at greater length in Section 2.4.7 of this chapter.)

2.9 Summary of the Chapter

Section 2.2 of this chapter commenced with a review of the literature relevant to the field of gifted education. The term *gifted* was initially used to describe students who were able to work through course curriculum faster, and whose work is measurably different from that of average students (Henry, 1920; Whipple, 1919). Terman's (1925) study of *genetic genius* and Hollingworth's (1926) study of *socially optimal intelligence* were among the first widely-published research of gifted children. Hollingsworth and Terman's research built upon the foundational work of Galton (1869) and Binet and Simon (1905).

More than 30 years later, the 1957 Russian launch of the Sputnik satellite facilitated a paradigm shift in how the United States viewed and prioritized gifted education. However, the initial momentum behind the movement was not sustained and the interest surge lulled. Fifteen years later, the former United States Commissioner of Education, Sidney P. Marland, Jr., in his 1972 report to Congress, reenergized the campaign by establishing a general definition of giftedness and urging school districts across the country to adopt the definition. Numerous American researchers have proffered variations and modifications to Marland's definition. Gardner (1983), for example, expanded upon the established definition of giftedness to include a concept of *multiple intelligences*. All researchers, however, have seemingly supported the premise that educators must respond to gifted learners with opportunities for challenge and growth.

Section 2.3 of this chapter reviewed the literature relevant to the field of learning environments, including the history and range of questionnaires available to researchers. Lewin (1936) and Murray (1938) paved the way for substantive research as it pertained to classroom learning environments. Lewin's formula, $B = f(P, E)$, depicted the environment as a determinant of human behavior. Murray's 'needs-press' model complemented Lewin's formula by depicting personality characteristics

as goal oriented and environmental characteristics as external. Murray's concepts of 'beta press' was further refined by Stern et al. (1956) into either 'private beta press' or 'consensual beta press'. The first learning environment questionnaires for use in the educational arena were developed in the late 1960s in the United States. Notably, the LEI was established by Walberg (1968). The development of the CES followed (Moos & Trickett, 1974; Trickett & Moos, 1973) which introduced social climate scales. Moos' influence continues to exist indirectly through the various instruments used to conduct current learning environments research and in the construction of new instruments (Fraser, 1998b).

Section 2.4 reviewed the range of questionnaires available to assess learning environments and their conceptualization, development, validation, and use. There is a variety of widely-applicable questionnaires that have been developed for assessing learning environments (Fraser 1998a, 1998b, 2007). Various instruments used to investigate and assess aspects of learning environments were included and discussed in this literature review: LEI, CES, ICEQ, MCI, CUCEI, QTI, SLEI, CLES, and PLACES/SMILES.

Section 2.5 examined the various types of research that have been conducted in the field of classroom learning environments, including emerging research being conducted throughout Asia. The reviewed literature supports the premise that the number of validated classroom environment questionnaires available to researchers makes it possible to investigate the nature of learning environments in classrooms at all levels of education. These instruments serve many functions, from an individual teacher's ability to conduct action research in a single classroom to researchers evaluating reform programs across an entire school district, state, or nation (den Brok, et al., 2006).

Section 2.6 placed particular focus on the conceptualization, development, characteristics, use, reliability, and validation of the WIHIC questionnaire (Fraser et al., 1996), the selected instrument for the present study. The WIHIC is one of the most widely-used instruments in the domain of learning environments research and has been cross-culturally validated (Dorman, 2003). In its current 56-item version, there are eight items in each of seven scales: Student Cohesiveness, Teacher Support,

Involvement, Investigation, Task Orientation, Cooperation, and Equity. Students use the five-point frequency response scale of Almost Never, Seldom, Sometimes, Often, and Almost Always. This literature review examined past studies that have used the WIHIC, including those that validated the instrument cross-nationally. These studies replicated past research by reporting associations between the learning environment and students' outcomes, and they provided suggestions to teachers regarding classroom environment dimensions that could be changed in order to improve student outcomes.

Section 2.7 presented a review of literature on the field of attitudes. Commencing with Thurstone (1928), various researchers have attempted to define the ostensibly abstract term 'attitudes' in an effort to conduct measurements of them (Aiken, 2000; Kerlinger, 1986; McLeod, 1992). Proving most promising for the purposes of the present study, a paraphrased version of Baron and Byrne's (1977) definition was adopted: individually-attributed beliefs, emotions, and behavioral tendencies that an individual has towards specific abstract or concrete objects. De Lourdes Mata et al. (2012) argued that attitudes can be linked directly to motivation and provide key information to a better understanding of attitudinal and motivational processes.

A significant part of Section 2.7 was devoted to the three components of motivation that are consistently associated with students' adaptive motivational beliefs: learning goal orientation, task value, and self-efficacy (Zimmerman, 2002). These components were included in the construction of the SALES (Velayutham et al., 2011), one of the instruments used in the present study. Self-regulation, the fourth and final component of the SALES questionnaire, was also reviewed. Additionally, an overview of the LASSI (Weinstein et al., 1987) and MSLQ (Pintrich et al., 1991), instruments commonly used to investigate student self-regulation, was presented. Section 2.7 concluded with a review of the TOSRA's (Fraser, 1981) significant contributions to assessing the field of attitudes specifically toward science.

Lastly, Section 2.8 presented literature on the topic of sex differences as they relate to gifted education and the field of learning environments. Siegle and Reis (1994) found that adolescent female gifted students are more confident than gifted males in language arts, while male gifted students express more confidence than females in

mathematics, science, and social studies. This research was complemented by the work of Swiatek and Lupkowski-Shoplik (2000) who found that males generally preferred science and technology, while females favored English, writing, foreign language, and reading. Overall, research has shown that females generally hold more favorable perceptions (both actual and preferred) of their classroom learning environments than males in the same classes (Goh & Fraser, 1996; Wahyudi & Treagust, 2004; Wong & Fraser, 1997).

Given that the field of education is ever-evolving, it remains essential that researchers continue to use validated instruments—and create new instruments—to investigate classroom learning environments. Research in recent years has confirmed that the classroom culture has a considerable influence on the quality of student learning experiences (den Brok et al., 2006; Fraser, 2012). Undoubtedly the strongest research traditions in the field of learning environments have involved associations between student outcomes and student perceptions of psychosocial characteristics of their classroom environments (Fraser, 2012; Fraser & Walberg, 1991; Haertel, Walberg, & Haertel, 1981).

The next chapter, Chapter 3, provides information concerning the methodology used in the present study, including the sample selection, instruments employed to gather the data, pilot study, research design, and the methods used to analyze the data.

Chapter 3

METHODOLOGY

What we see depends mainly on what we look for.
–Sir John Lubbock

3.1 Introduction

The purpose of this chapter is to describe all steps and procedures employed during the course of this study. Section 3.2 recapitulates this study's three research questions. Section 3.3 describes the pilot study implemented in order to ensure the face validity of the questionnaires. Section 3.4 provides background information and particulars about the selection of the sample. Section 3.5 examines ethical considerations pertaining to this research, specifically involving the participation of minors. The selected instruments used in this study, the WIHIC and SALES, are described in Section 3.6. The data collection process is discussed in Section 3.7, while Section 3.8 describes the data analyses used. Lastly, a chapter summary of the information contained herein is provided in Section 3.9.

3.2 Specific Research Questions

Research Question #1

- *Are the revised What Is Happening In this Class? (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) questionnaires valid and reliable for assessing classroom learning environments and attitudes, respectively, when used with middle-school students within the large urban school district of Miami-Dade County, Florida?*

Research Question #2

- *Do students' perceptions of their classroom learning environment and attitudes vary with:*
  - *(a) giftedness*
  - *(b) sex*
  - *(c) the interaction of giftedness and sex?*

Research Question #3

- *Do associations exist between the classroom learning environment and student attitudes?*

3.3 Pilot Study

This section details the process of conducting a pilot study prior to the commencement of the formal study. It is widely acknowledged that pilot studies should often precede the main study and form an important component of the research design (Forgasz & Kaur, 1997). Henk (1987) fundamentally believed that "the methodology of an investigation can be enhanced considerably by conducting pilot studies" (p. 66). Wiersma (1991) argued that pilot studies should be "conducted for the purpose of gaining additional information by which the major study can be improved—for example, an exploratory use of the measurement instrument with a small group for the purpose of refining the instrument" (p. 427).

In accordance with Henk and Wiersma's platforms, I conducted a pilot study prior to the formal gathering of data in order to confirm the clarity of the instruments' items and instructions, as well as to assess the amount of time students required to complete the questionnaires. It was important to ensure that middle-school students could easily understand and complete the questionnaires without experiencing fatigue. Additionally, the pilot study was conducted in order to verify that the selected procedures and techniques worked satisfactorily and to ensure face validity in terms of students interpreting the questionnaire's items in the ways that were intended (Cohen, Manion, & Morrison, 2011). According to Munby (1997), the most salient check on face validity involves seeking the opinions of a representative sub-sample about their comprehension of the questionnaire's items. Hence, through informal interviews, I sought to determine whether students found any items or words to be unclear, ambiguous, or confusing. Suggestions were solicited for the rephrasing of words and/or sentences in order to simplify items and properly represent the constructs to middle-school students.

Lastly, as recommended by De Vaus (2002) and Dillman (2000), the appropriateness of the layout and design of the questionnaires, and their ability to maintain students' interest, were also evaluated.

After obtaining the approval of my school principal and securing parental consent from the selected student participants, the pilot study was conducted with 20 middle-school students (10 gifted students and 10 non-gifted students) in Grades 6 and 7 who were enrolled in my own classes. The selected sample adhered to Wiersma's (1991) suggestion that pilot studies should be conducted with individuals who are familiar with the variables that will be included in the formal study.

Following the students' completion of both the WIHIC and SALES questionnaires, I interviewed each student. The intention of my questioning was to ascertain whether students understood the phraseology of the questionnaires and were able to aptly respond without difficulties. Researcher observations suggested that students responded well to the electronic questionnaire format and were engaged in the survey completion process. Students indicated that they could complete the survey without experiencing fatigue. However, postsurvey administration interviews with pilot study respondents revealed that selected items and/or words were deemed ambiguous. Consequently, suggestions were solicited for the rephrasing of these items and/or words in order to simplify the text for middle-school students, while adequately representing the constructs of the questionnaire. Based on respondents' feedback and suggestions, modifications were subsequently made to the surveys as described in Section 3.6.1 for the WIHIC and Section 3.6.2 for the SALES.

Overall, the pilot study confirmed that the selected procedures and techniques for administering the WIHIC and SALES worked satisfactorily and supported the questionnaires' face validity.

3.4 Study Participants

The present study compared gifted and non-gifted middle-school students, all of whom were enrolled in advanced-level classes and in 'heterogeneous' classrooms (meaning both gifted and non-gifted students were assigned to the same teacher, in the

same classroom, at the same time). Section 3.4.1 describes the manner in which the targeted sample was selected. Section 3.4.2 outlines the process of differentiating gifted and non-gifted student respondents for the purpose of the present study.

3.4.1 Sample Selection

Quantitative research methods require reasonably large and carefully selected samples of individuals in order to maximize the generalizability of the findings (Shulman, 1997). In the present study, the sample consisted of 495 middle-school students (238 gifted students and 257 non-gifted students) in Grades 6, 7, and 8 in 31 classes from 10 different schools.

A concerted effort was made to collect data from a balanced proportion of male and female students. The age of student respondents ranged from 11 to 15 years. All students were enrolled in the third nine-week grading period of either Grade 6, 7, or 8. Because each grading period is comprised of nine weeks of study, all students who participated in the present study had been enrolled in their respective institutions for at least 20 weeks. All students attended various middle schools or K–8 Centers within the South Region of the Miami-Dade County Public School District. Selected schools had student populations with similar racial and socioeconomic status demographics and were all designated Title I by the Florida Department of Education's Bureau of Federal Educational Programs. The Miami-Dade County Public School District identifies a school as Title I if at least 40% of its student population is from low-income families (as evidenced by the number of children eligible for free and reduced-cost lunches under the National School Lunch Program).

The target sample size included allowance for attrition, misadventure, and other potentially hampering circumstances.

3.4.2 Differentiating Between Gifted and Non-Gifted Student Respondents

Because the present study's sample was comprised of gifted and non-gifted students, it was necessary for this investigator to appreciate the entry threshold for giftedness in order to differentiate between, and balance the number of, gifted and non-gifted respondents.

Varying definitions of giftedness were previously discussed in Chapter 2, Section 2.2. In the United States, gifted education, unlike other sectors of special education, is not regulated at a federal level. Consequently, each state's department of education is charged with determining the process for identifying gifted students, the needs of gifted students in its state, and if such needs will be a compulsory function of public education. If a state does not consider gifted education mandatory, individual school districts can elect to adopt their own definitions of what constitutes a gifted child.

At a national level, independent authorities and educational organizations often define giftedness differently and a precise definition ranges from conservative (demonstrated by a high IQ) to liberal (multiple criteria). The majority of states, however, have adopted some variance of the definition established in the 1988 reauthorization of the United States' Elementary and Secondary Education Act (National Association for Gifted Children, 2008). The public law, approved by the 107th Congress of the United States in 2002, was subsequently renamed the No Child Left Behind Act of 2001. Pursuant to the United States Department of Education (2002), the law provides that:

> …the term 'gifted and talented', when used with respect to students, children, or youth, means students, children, or youth who give evidence of high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services or activities not ordinarily provided by the school in order to fully develop those capabilities. (p. 535)

In each individual school district, the determination of whether a student meets eligibility requirements for gifted services is also dependent on how giftedness is defined. Thus, while millions of students are considered gifted and talented, interpretations regarding eligibility requirements for receiving service vary from one state to another. Likewise, it is common for definitions and entry thresholds to vary from school district to school district (Smiley, 2013).

For purposes of this study, the identification of gifted students was conducted in accordance with the Florida Plan for K–12 Gifted Education (Bureau of Curriculum and Instruction, 2010). Florida's current identification of giftedness requires students to be individually administered a standardized test of intelligence, thus making IQ testing one component of eligibility. A composite score of 130 is required, which is

two standard deviations above the mean. In Miami-Dade County, this process is referred to as 'Plan A'. Additionally, the State affords school districts the option of developing an alternative plan for underrepresented populations to increase their participation in gifted programs. In Miami-Dade County, the alternative pathway to gifted placement is referred to as 'Plan B' (Miami-Dade County Public Schools, 2012) and requires that students be either limited English proficient or from a low socioeconomic family. Plan B further requires students to score a minimum of 112 on a standardized test of intelligence. Prior to the commencement of this study, all gifted student participants had previously been labeled gifted via either Plan A or Plan B. (See Appendix A for a complete overview of the Plan B eligibility criteria for Miami-Dade County Public Schools.)

Utilizing the school district's Integrated Student Information System (ISIS) database, it was possible to determine if students were either labeled as gifted or non-gifted. Gifted students were identified in the ISIS database with the letter 'L', which appeared in the field titled 'Primary Exceptionality'. Non-gifted students were identified if the letter 'L' was not present in the primary exceptionality field. In the present study, of the 495 middle-school student respondents, 238 respondents were identified as gifted and 257 respondents were identified as non-gifted.

The sample size is noteworthy in that, of the total number of gifted students eligible for participation, all but 27 students participated in this study. This was because of one school principal's denial of consent. In accordance with the school district's Board Rules, "The principal of the individual school has the privilege of deciding if [School District] Committee-approved outside research will be conducted within his/her school" (School Board Rules of Miami-Dade County, Florida, 2011). Hence, 89.8% of identified students successfully participated. In total, 10 of the desired 11 school principals provided consent, enabling research to be conducted in 90.9% of the identified school sites. (See Appendix B for the *Letter of Inquiry: School Site Principal*.)

3.5 Ethical Considerations

"The responsibility for ethical research ultimately lies with the individual researcher" (Anderson, 1998, p. 17), but researchers still must operate within the established borders of the modern world of regulatory bodies.

The American Educational Research Association (AERA), founded in 1916, published a code of ethics that incorporates a set of standards intended to guide researchers who specifically work in the realm of education. The AERA standards:

> …remind us that we are involved not only in research but in education. It is, therefore, essential that we continually reflect on our research to be sure that it is not only sound scientifically but that it makes a positive contribution to the educational enterprise. (American Educational Research Association, 2002, p. 1)

Given that the present study involved humans, I fully accepted the responsibility of being both ethically and legally bound to protect participants from any potential harm or forms of abuse that might have arisen as a result of participating in this study.

Upon receiving an ethics approval number from Curtin University, as well as approval from the Miami-Dade County Public School District's Department of Research Services, target schools and gifted classrooms were identified and selected to participate in this study.

The purpose of the research and the selected students' involvement in the study were explained to the sample in the form of a written letter, titled *Participant Information* (see Appendix C), and in-person during school hours. This information was also provided to students' parents/legal guardians in the form of a written letter, titled *Parental Consent Form* (see Appendix D). The latter letter, intended for students' parents/legal guardians, advised of the intentions associated with the study and my role as a teacher–researcher. This letter also made clear that students' participation would be voluntary and that participants could elect to withdraw from, and discontinue their involvement in, the study at any time. It was further stipulated that the confidentiality of students' data would be ensured; students' anonymity would be guaranteed as all participants would be coded as numeric values so as to remove identifying features from the data during data preparation and entry. This letter

sought formal permission for the researcher to administer the questionnaires. The written consent of parents/legal guardians was a required condition for students' participation given that all students in the sample were minors. Consequently, any student who did not receive written consent from his or her parent/legal guardian was not permitted to participate in the study.

At all times during this study, I strictly abided by the ethical guidelines set forth by Curtin University's Human Research Ethics Committee for research involving humans. I concurrently acted in accordance with the Miami-Dade County Public School District's Department of Research Services' published guidelines for conducting educational research.

3.6 Instrument Selection

As previously reported in Chapter 2, past research has found a link between a favorable learning environment and positive student attitudes (Fraser, 1998a). The present study assessed these two domains. The learning environments of gifted and non-gifted classrooms were investigated with the WIHIC questionnaire and students' attitudes were investigated with the SALES questionnaire. I elected to use questionnaire surveys because they have proven highly valid and efficient for data collection with a large number of respondents and they lend themselves to quantitative analysis. According to Anderson (1998), a well-constructed questionnaire "permits the collection of reliable and reasonably valid data in a simple, cheap and timely manner" (p. 170).

3.6.1 Selection of and Revisions to the WIHIC

The WIHIC questionnaire, developed by Fraser, Fisher, and McRobbie (1996), combines past salient environmental scales with new scales that address contemporary concerns and brings parsimony to the field of learning environments. The WIHIC incorporates a wide range of dimensions from an array of questionnaires that are significant to the present condition in classrooms and have also shown to be important predictors of outcomes (Fraser, 2012; Kim, Fisher, & Fraser, 2000). This questionnaire requires little time to complete and questions are clear and concise,

making it an appropriate instrument to use with middle-school students whose attention spans are typically shorter than those of adults.

Most appealing was the fact that the WIHIC has consistently been found valid and reliable when used with secondary-school students in numerous studies around the world (Fraser, 2012) and "has achieved almost bandwagon status in the assessment of learning environments" (Dorman, 2008, p. 181). Moreover, and relevant to the present study, many past studies have successfully employed the WIHIC in Miami-Dade County, Florida (Allen & Fraser, 2007; Helding & Fraser, 2013; Pickett & Fraser, 2009; Robinson & Fraser, 2013; see Chapter 2, Section 2.6, for a more extensive review of the literature).

In its current form, the WIHIC questionnaire includes seven scales, with eight items in each scale, and assesses students' perceptions of seven dimensions: Student Cohesiveness, Teacher Support, Investigation, Involvement, Task Orientation, Cooperation, and Equity. The WIHIC presents numerous statements that ask the respondent to agree or disagree using a five-point frequency scale of Almost Never, Seldom, Sometimes, Often, and Almost Always.

Based on respondents' feedback from the pilot study, the decision was made to eliminate the Investigation scale for the purposes of the present study. The word 'investigate' caused confusion among respondents because of misinterpretation; the majority of students had difficulty applying the term to classes unrelated to science. Additionally, throughout the questionnaire, the word 'members' was replaced with the word 'students', which respondents accepted as a more familiar term. Some further minor wording modifications were made to selected items, with a concerted effort being made not to jeopardize the underpinnings of the instrument's original scales. As a result of feedback from the pilot study, this investigator added wording to selected items in order to clarify the meaning of statements for respondents. For example, "I am ready to start this class on time" was modified to "I am ready to start this class on time *when the bell rings*". The addition of the text "when the bell rings" clarified what is meant by 'on time'. Similarly, this investigator added text to selected items in order for the items to coincide with local school rules. Take, for example, the item which was revised to read: "*If the teacher allows me*, I share my books and

materials with other students when doing assignments." By inserting the phrase "if the teacher allows me" at the beginning of the original item, the statement becomes aligned with the majority of classroom rules students are expected to follow.

A copy of the modified WIHIC questionnaire used in the present study can be found in Appendix E.

3.6.2 Selection of and Revisions to the SALES

Student attitudes were evaluated using the new SALES questionnaire, developed by Velayutham et al. (2011). The SALES was created to economically assess the factors that contribute towards students' adaptive motivated and self-regulated learning engagement in science. The questionnaire is intended to provide instructors with a reliable, valid, and convenient tool for gathering information about the motivation and self-regulation of students. This information, in turn, could guide classroom teachers in directing and focusing their teaching practices (Velayutham et al., 2011).

The SALES questionnaire includes four scales, with eight items in each scale, and assesses students' perceptions of four dimensions: Learning Goal Orientation, Task Value, Self-Efficacy, and Self-Regulation. The survey presents numerous statements that ask the respondent to agree or disagree using the five-point Likert scale of Strongly Agree, Agree, Not Sure, Disagree, and Strongly Disagree.

Qualitative and quantitative research methods were used in the initial development and validation of the SALES. In order to maximize content validity, identification of key theories and research concerning students' adaptive learning engagement was conducted. Scales were defined based on a careful analysis of literature to ensure sound theoretical underpinnings. Individual items within the scales were either adapted from previously validated questionnaires or written by the developers. To establish face validity, 10 teachers assessed each item and indicated whether each item represented the proper corresponding scale. These teachers also provided feedback as to the suitability and appropriateness of the items. Based on the acquired feedback, items were then revised. Lastly, a pilot study was conducted with 52 students from two mixed-ability Grade 8 science classes in Perth, Western Australia

in order to confirm whether students responded to the items on the basis intended by the questionnaire developers.

The initial validation of the SALES involved a large-scale administration to a sample of 1,360 students in Grades 8, 9, and 10 from 78 lower-secondary science classes in five schools within the Perth metropolitan area (Velayutham et al., 2011). Convergent and discriminant validity were investigated through exploratory factor analysis and internal consistency reliability. Principal component analysis with both varimax and oblique rotation was conducted and all items loaded above 0.50. The eigenvalue for each factor was greater than 1, as recommended by Kaiser (1960). Therefore, all items were retained. The Cronbach alpha coefficient was calculated for each factor to determine the internal consistency reliability. The results showed that the Cronbach alpha coefficient for each factor was above 0.90, confirming the reliability of the constructs. Thus, the factor loadings and internal consistency measure confirmed convergent validity of the SALES.

The concurrent validity of the SALES was investigated using ANOVA. The eta^2 value was significant ($p<0.001$) for each scale, which supported the ability of the scales to differentiate between classes. Finally, predictive validity was confirmed when all the scales in the SALES were statistically significantly associated with students' achievement (Velayutham et al., 2011).

Rogers and Fraser (2013) further validated the SALES with a sample of 431 science students in Grades 9 and 10 from two Catholic schools and two independent schools in Adelaide, South Australia. These researchers used the SLEI, SALES, and a scale from the TOSRA to investigate sex and frequency of practical work as determinants of science students' perceptions of their learning environment, attitudes, and aspirations. Associations between laboratory classroom environment and students' attitudes and aspirations were also investigated.

For Rogers and Fraser's (2013) Australian sample, all scales exhibited satisfactory factorial validity given that each had a factor loading of at least 0.40 for its *a priori* scale and a factor loading of less than 0.40 with each other scale. The percentage of variance ranged from 4.96% to 42.18% for different attitudinal scales. The total

proportion of variance accounted for was 66.36%. The eigenvalue varied from 1.88 to 16.03 for different attitudinal scales. Thus, the SALES exhibited sound internal consistency reliability, replicating the findings of Velayutham et al. (2011). Furthermore, Rogers and Fraser's (2013) study revealed statistically significant sex differences for the attitudinal scale of Self-Efficacy (effect size of 0.28), with males expressing more positive attitudes than females. This finding supports the suitability of the SALES for investigating sex as a determinant of student attitudes. Lastly, associations between the learning environment and students' attitudes and aspirations were found. The results suggested a positive relationship between a more favorable laboratory learning environment and students' attitudes.

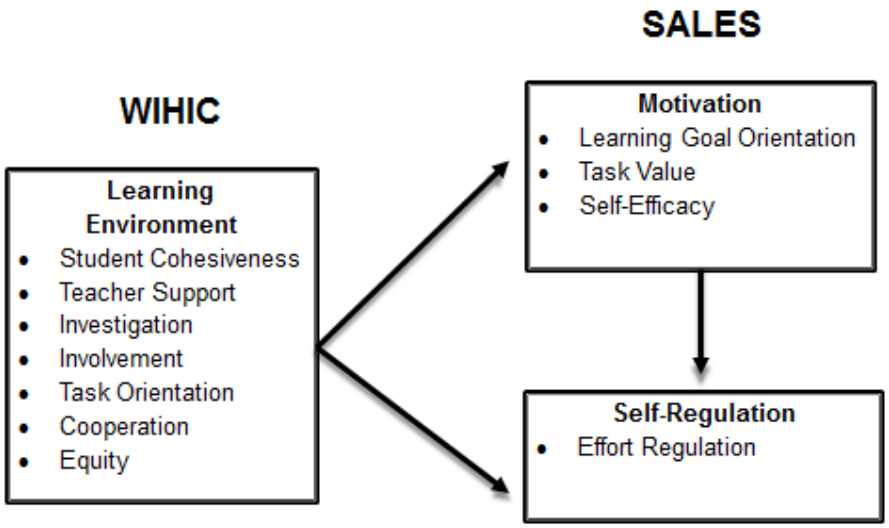
As a result of Velayutham et al.'s (2011) confirmation of content validity, face validity, convergent and discriminant validity, and predictive validity of the SALES, along with Rogers and Fraser's (2013) findings, the SALES was selected for use in the present study. However, in order to more accurately reflect the scope and purpose of the present study, the modified SALES questionnaire was renamed Students' Adaptive Learning Engagement in School. The word 'School' replaced the word 'Science' in order to reflect the instrument's applicability to academic subjects beyond science. The instrument's acronym and theoretical constructs, however, remained intact.

Likewise, for the purpose of this study, the word 'science' contained within the text of the survey's individual items was either eliminated or replaced with the word 'lessons', making the instrument applicable to assess academic subjects beyond science. Furthermore, in selected items, additional wording was inserted within parenthesis in order to clarify and/or further define the statement. For example, for the item "The lessons I learn are of practical *(useful)* value", the word 'useful' was added in parenthesis to define the word 'practical'. This type of modification was supported by respondent feedback during the pilot study.

Chapter 2, Subsection 2.7.3.4, previously acknowledged two other instruments regularly used to assess students' self-regulated learning: the 80-item LASSI (Weinstein et al., 1987) and the 81-item MSLQ (Pintrich et al., 1991). However, the SALES was selected for the present study because the instrument features a concise

and parsimonious scale to assess students' self-regulation. Furthermore, as discussed earlier in this section, the SALES is comprised of three key components of motivation that have been consistently associated with students' adaptive motivational beliefs, namely, learning goal orientation, task value, and self-efficacy. Each of these components is integral to successful engagement in self-regulated learning (Zimmerman, 2002).

Figure 3.1, an adapted research model formulated by Velayutham et al. (2011), graphically depicts the WIHIC's seven psychosocial aspects of the learning environment (student cohesiveness, teacher support, involvement, investigation, task orientation, cooperation and equity) individually influencing each of the three motivation constructs (learning goal orientation, task value and self-efficacy) and self-regulation assessed by the SALES. Additionally, Figure 3.1 illustrates how each of the three motivation constructs (learning goal orientation, task value and self-efficacy) is predicted to influence self-regulation in learning.



Note. Adapted from Velayutham et al. (2011).

Figure 3.1 Representation of the Research Model Linking Learning Environment, Motivation in Learning, and Self-Regulation in Learning Scales

A copy of the modified SALES questionnaire used in the present study can be found in Appendix F.

3.7 Data Collection

Once I had printed, counted, and labeled all necessary parent and student information/consent forms, the materials (along with a self-addressed returned envelope) were mailed to selected school sites where the selected teachers functioned as survey administrators. These materials were mailed via the school district's internal mail service at no additional charge to the school district or to me. Upon receipt of the materials, selected teachers distributed the informational and consent forms to student participants in group settings. After the respondents and their parents had completed the consent forms, selected teachers then placed all materials inside the preaddressed envelope and deposited them in the school district's internal school mail for delivery to me. Upon receipt of the returned materials, I checked each consent form for completeness. Once this was completed, I generated a list of those students who were cleared to participate in the study. This process was completed confidentially within the confines of my personal office space at my work site. Additionally, to maintain confidentiality, students were identified using only their seven-digit student identification numbers issued by the school district. I personally visited each participating school site and met with the principals and/or their designees to review student participant lists and provide copies of their completed parent and student consent forms. When in-person visits could not be arranged, meetings were arranged telephonically and documents exchanged via e-mail. The principals, and/or their designees, advised their teachers and me as to how they desired to schedule the survey administration so as to minimize the disturbance of normal classroom routines and daily school operations.

Permission to utilize the school district's technology for purposes of this study was obtained by each school site principal prior to the commencement of this research study. The data collection was completed via the Internet-based program SurveyMonkey (www.surveymonkey.com), which has previously been used successfully for quantitative-based research at the doctoral level (Olmstead, 2011; Tsouloupas, 2011; Wagner, 2008). This particular program was selected because of its state-of-the-art security infrastructure and enhanced 'Secure Sockets Layer' encryption package used to protect survey links and survey pages during electronic transmission. Additionally, this technology can minimize the potential for errors

caused by having to manually enter results into a database or statistical program for analysis.

Students completed the surveys independently, in group settings, within each school's established computer laboratory classroom(s), during prearranged times. I made myself available to assist all survey administrators and oversee the consistency of the survey administration process at each of the 10 school sites. The entire data-collection process took 12 weeks to complete.

A printout of all electronic questionnaires and completed response sheets was stored in a locked filing cabinet within my personal office at my worksite and destroyed at the conclusion of this study by means of confidential shredding. Electronic data will remain stored on a computer hard-drive accessible only to me and members of my thesis committee for a period of five years, after which time the files will be destroyed.

3.8 Data Analysis

The purpose of this section is to describe the statistical analyses employed to answer the research questions in the present study. The first aim was to determine the validity of the WIHIC and the revised SALES questionnaires. The procedures for instrument validation are discussed in Section 3.8.1. The second research question involved investigating giftedness, sex, and the interaction of giftedness and sex as determinants of students' perceptions of their learning environment and attitudes. The procedures for investigating these determinants are discussed in Section 3.8.2. The third, and final, research question involved whether associations exist between the classroom learning environment and student attitudes. The procedures for investigating environment outcome associations are delineated in Section 3.8.3.

3.8.1 Instrument Validation

"Without rigor, research is worthless, becomes fiction, and loses its utility" (Morse, Barrett, Mayan, Olson, & Spiers, 2002, p. 2). Thus, data analysis and interpretation methods were selected to ensure that threats to rigor were minimized. Quantitative data analyses were undertaken using the IBM SPSS Statistics 20.0 package.

The first research question involved the reliability and validity of the modified WIHIC and SALES questionnaires when used with gifted and non-gifted middle-school students in Miami-Dade County, Florida. The questionnaires were administered to 495 students in Grades 6, 7, and 8 in 31 classes from 10 middle schools and K–8 centers in Miami-Dade County, Florida.

The data gathered from the 495 students were statistically analyzed using principal axis factor analysis with varimax rotation and Kaiser normalization to check the *a priori* structure of the questionnaires. Only items with factor loadings that were larger than 0.40 on their own scale and less than 0.40 on the other scales were retained. The percentage of the total variance extracted with each factor and the eigenvalue for each scale were also calculated. Results of these analyses are reported in Section 4.2.1 for the WIHIC and Section 4.2.2 for the SALES.

Next, the internal consistency reliability for each WIHIC and SALES scale was calculated for both the individual and the class mean as the units of analysis for the whole sample of 495 students in 31 classes. The Cronbach alpha reliability coefficient was used as an index of scale internal consistency. The results of the internal consistency reliability analysis for the WIHIC and SALES are reported in Section 4.2.3. Finally, the ability of each WIHIC and SALES scale to differentiate between perceptions of students in different classrooms was determined using a one-way ANOVA. The eta² statistic, representing the proportion of variance in scale scores accounted for by class membership, was also calculated. The results of these analyses are reported in Section 4.2.4.

3.8.2 Giftedness, Sex, and the Interaction of Giftedness and Sex as Determinants of Students' Perceptions of the Learning Environment and Attitudes

The second research question concerned whether students' perceptions of their classroom learning environment and attitudes vary with giftedness, sex, and/or the interaction of giftedness and sex. In order to investigate this research question, a two-way multivariate of analysis (MANOVA) was performed to test giftedness, sex, and the giftedness–by–sex interactions as predictors of scores on the six learning environment scales from the WIHIC and the four attitudinal scales from the SALES. Because the multivariate tests using Wilks' lambda criterion yielded significant

results for the set of dependent variables as a whole, the univariate analysis of variance (ANOVA) was interpreted separately for each dependent variable.

Cohen's (1988) *d* is the difference between two means divided by the pooled standard deviation of a group. In the present study, to check the magnitudes of differences, effect sizes (Cohen's *d*) were used to express giftedness differences and sex differences in standard deviation units. Additionally, eta^2 values indicated the proportion of variance in scale scores accounted for by the independent variables, giftedness and sex, as well as the interaction between these independent variables. The results of these analyses are reported in Section 4.3.

3.8.3 Associations Between Learning Environment and Student Attitudes

The third research question concerned associations between students' perceptions of their learning environment and their attitudes. To investigate these associations, simple correlation and multiple regression analyses were conducted at two units of analysis (individual and class mean). Simple correlation was employed to examine the bivariate relationship between student attitudes and each classroom learning environment scale. Multiple regression analysis was conducted to determine the joint influence of the set of the learning environment scales on student attitudes. Regression coefficients were used to provide information about which environment scales contributed to variance in students' attitudes when all other environment scales were mutually controlled. The results of these analyses are reported in Section 4.4.

3.9 Summary of the Chapter

This chapter presented an overview of the methodology used in the present study. Section 3.2 restated the study's three research questions. Section 3.3 discussed the definition of giftedness and entry threshold for gifted education in the State of Florida and the Miami-Dade County Public School District. The selection of the target sample was presented in Section 3.4. Section 3.5 outlined the study's ethical considerations, emphasizing the caution one must apply when working with minors. Section 3.6 presented the selected instruments, the WIHIC and SALES, and detailed the rationale for their selection, as well as the process for making revisions. Finally,

the data-collection process was delineated in Section 3.7 and the data-analysis process was reviewed in Section 3.8.

Chapter 4 answers the research questions proffered in this study and reports the results of the data analyses conducted. Tables and figures summarizing the data are included, along with detailed explanations of the findings pertaining to each of the three research objectives.

Chapter 4

DATA ANALYSES AND RESULTS

'For example' is not proof.

–Yiddish Proverb

4.1 Introduction

The purpose of this chapter is to report findings based on analyses of the quantitative data collected in this research study using the WIHIC and SALES questionnaires. Quantitative data analyses were undertaken using the IBM SPSS Statistics 20.0 package. This chapter is organized and presented in sections and subsections structured around the study's three central objectives: (1) to validate the WIHIC and SALES questionnaires; (2) to ascertain whether students' perceptions of their classroom learning environment and attitudes vary with giftedness, sex, and/or the interaction of giftedness and sex; and (3) to determine whether associations exist between the classroom learning environment and student attitudes.

As previously discussed in Chapter 3, Section 3.6, the data were collected utilizing a modified version of the WIHIC questionnaire and a modified version of the SALES questionnaire.

The original WIHIC questionnaire includes seven scales, with eight items in each scale, assessing students' perceptions of seven dimensions: Student Cohesiveness, Teacher Support, Investigation, Involvement, Task Orientation, Cooperation, and Equity. The WIHIC presents numerous statements that ask the respondent to indicate how often a practice occurs using a five-point frequency scale of Almost Never, Seldom, Sometimes, Often, and Almost Always. Chapter 2, Section 2.6.2 provides a more thorough description of the WIHIC questionnaire and Chapter 3, Section 3.6.1 provides a rationale as to why, in the present study, as a result of feedback from respondents in the pilot study, the decision was made to eliminate the Investigation scale.

The SALES questionnaire, the second instrument used in this study, includes four scales, with eight items in each scale, that assess students' perceptions of four dimensions: Learning Goal Orientation, Task Value, Self-Efficacy, and Self-Regulation. The survey presents numerous statements that ask the respondent to agree or disagree using a five-point frequency scale of Strongly Agree, Agree, Not Sure, Disagree, and Strongly Disagree. The SALES questionnaire was discussed in greater detail in Chapter 3, Section 3.6.2.

The sample consisted of 495 middle-school students (238 gifted students and 257 non-gifted students) in Grades 6, 7, and 8, in 31 classes, from 10 different school sites within the South Region of the Miami-Dade County Public School District. A more detailed description of the sample used in this study was provided in Chapter 3, Section 3.4.

Within the current chapter, Section 4.2 reports the validity and reliability of the revised versions of the WIHIC and SALES questionnaires. Section 4.3 reports the differences between gifted and non-gifted middle-school students in terms of their perceptions of classroom learning environment and attitudes (Section 4.3.1), as well as the differences between sexes (Section 4.3.2), and the interaction between giftedness and sex (Section 4.3.3). Section 4.4 reports associations between classroom learning environment and student attitudes. Lastly, Section 4.5 summarizes and concludes this chapter.

4.2 Validity and Reliability of Questionnaires

This section presents analyses and results pertaining to the first research question:

> *Are modified What Is Happening In this Class? (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) questionnaires valid and reliable for assessing classroom learning environments and attitudes, respectively, when used with middle-school students within the large urban school district of Miami-Dade County, Florida?*

Validity refers to the overall evaluation or judgment of the appropriateness of data, while reliability signifies the extent to which participant scores are free from error (McMillan, 2008a). In order to check the validity and reliability of the modified

WIHIC and SALES questionnaires, the following statistical measures were used: factor structure (Section 4.2.1 for the WIHIC and Section 4.2.2 for the SALES) internal consistency reliability (Section 4.2.3), and the ability to differentiate between the perceptions of students in different classrooms using one-way ANOVA (Section 4.2.4).

4.2.1 Factor Structure for the Modified Version of the WIHIC

The WIHIC is one of the most widely-used instruments in the domain of learning environments research and has been cross-culturally validated (Dorman, 2003). The instrument was developed by Fraser et al. (1996) in order to gather secondary students' perceptions of their classroom learning environment. By combining past learning environmental scales with new scales that address contemporary concerns, the WIHIC establishes parsimony in the field of learning environments (Aldridge et al., 1999; Dorman, 2003). Notably, the WIHIC measures elements of all dimensions cited by Moos (1979) and measures a wide range of dimensions that are important to the current state of affairs in classrooms (Dorman, 2003). Fraser (2002b) reported that the WIHIC demonstrates predictive validity for both cognitive and affective student outcomes. The instrument has an extensive recent history of confirmed validity and reliability in many countries, including: Australia (Dorman, 2003, 2008); India (Koul & Fisher, 2005); Singapore (Chionh & Fraser, 2009; Khoo & Fraser, 2008); and the United States (den Brok et al., 2006; Helding & Fraser, 2013; Ogbuehi & Fraser, 2007; Pickett & Fraser, 2009; Wolf & Fraser, 2008). Cross-national studies with the WIHIC include comparisons between students in Australia and Taiwan (Aldridge & Fraser, 2000), Australia and Canada (Zandvliet & Fraser, 2005), and Australia and Indonesia (Fraser, Aldridge, & Adolphe, 2010). Perhaps most notable is Dorman's (2003) cross-national study conducted in Australia, Britain, and Canada, which validated the WIHIC using a sample of 3,980 high school students and substantiated invariant factor structures for country, grade level, and student gender. More detailed information about the development, characteristics, and validity of the original WIHIC can be found in Chapter 2, Section 2.6. Additionally, specific modifications made to the WIHIC for the present study are discussed in Chapter 3, Section 3.6.1.

The data collected from the 495 students were analyzed to provide statistical validation for the 48-item, six-scale, modified version of the WIHIC questionnaire. Factor and item analyses were conducted to identify questionnaire items whose removal would improve the internal consistency reliability and factorial validity of each WIHIC scale. To verify the structure of the modified version of the WIHIC, principal axis factor analysis with varimax rotation and Kaiser normalization was conducted.

Factor analysis is a statistical method used to describe the variability among observed, correlated variables. The model differentiates between manifest (measured) variables and latent (unmeasured) variables (Mulaik, 1987). The objective of factor analysis is to expose any latent variables that cause the manifest variables to covary (Costello & Osborne, 2005). Principal factor analysis, also referred to as common factor analysis, is essentially the analysis of shared variance among items. Often used to explore an underlying factor structure, this process seeks the least number of factors that can account for the common variance in a set of variables. "During factor extraction the shared variance of a variable is partitioned from its unique variance and error variance to reveal the underlying factor structure; only shared variance appears in the solution" (Costello & Osborne, 2005, p. 2).

In the present study, varimax rotation with Kaiser normalization was employed. Kaiser (1958, 1959) developed this procedure in an effort to obtain relative stability of solutions across samples (Comrey & Lee, 1992). Before commencing varimax rotation, the factors are scaled to unit length by dividing each item's loading by the square root of its individual communality. Following the rotation, the item loadings on the factors are rescaled to proper size by multiplying the generated item loading by its communality. This process affords equal weight to all items in determining the rotations (Pett, Lackey, & Sullivan, 2003). McDonald (1985, p. 40) defined factor rotation as "performing arithmetic to obtain a new set of factor loadings from a given set". Hair, Anderson, Tatham, and Black (1998) defined it as a process of turning the reference axes of the factors about their origin to achieve a simple structure and a theoretically more meaningful factor solution. In essence, factor rotation works to create factors which are as unique from each other as possible (Hinton, 2004).

Varimax rotation (Kasier, 1958, 1959) is the most commonly used orthogonal rotation method (Pett, Lackey, & Sullivan, 2003). This statistical process essentially changes coordinates in order to maximize the sum of the variances of squared loadings. The objective of varimax rotation is to simplify the columns of the unrotated factor-loading matrix. This is accomplished by maximizing differences between the high and low loadings of a particular factor. Consequently, each factor has either large or small loadings on any particular variable. De Laurentis, Maino, and Molteni (2010) concluded that varimax rotation yields results which make it as easy as possible to identify each variable with a single factor.

Factor loadings indicate how strongly each item is related to a particular factor (Field, 2009). In order for an item to be retained in my study, its loading on its *a priori* scale needed to be at least 0.40 and its loading on each of the other five WIHIC scales needed to be less than 0.40. This is the minimum value conventionally accepted as meaningful for loadings in factor analysis. Hence, the 0.40 cut-off is a frequently-used criterion by researchers, especially for exploratory purposes (Hai et al., 1998; Raubenheimer, 2004). Furthermore, past researchers using the WIHIC questionnaire have successfully used a cut-off loading of 0.40 (Quek et al., 2005; Fraser, Aldridge, & Soerjaningsih, 2010).

Table 4.1 shows the factor loadings for all retained items of the WIHIC. The retained items all had loadings above 0.40 on their *a priori* scale, ranging from 0.42 to 0.75, and less than 0.40 on each of the other five scales. There were 288 possible loadings (48 items x 6 scales = 288). Except for only three of the possible 288 cases, the original six-factor structure was replicated perfectly. Therefore, a total of 45 of the original 48 items were retained. As illustrated in Table 4.1, Items SC8, IN7, and IN8 each had a loading of less than 0.40 on their own scale and, therefore, were omitted from subsequent analyses.

The bottom of Table 4.1 records the percentage of the cumulative variance extracted with each factor and the eigenvalue for each scale. The cumulative variance can be used to check whether a sufficient number of factors have been retained and eigenvalues show the relative importance of each factor (Field, 2009).

TABLE 4.1 Factor Analysis Results for WIHIC

Item	Factor Loadings					
	Student Cohesiveness	Teacher Support	Involvement	Task Orientation	Cooperation	Equity
SC1	0.68					
SC2	0.46					
SC3	0.45					
SC4	0.65					
SC5	0.52					
SC6	0.42					
SC7	0.56					
TS1		0.58				
TS2		0.72				
TS3		0.67				
TS4		0.62				
TS5		0.57				
TS6		0.67				
TS7		0.46				
TS8		0.48				
IN1			0.74			
IN2			0.75			
IN3			0.49			
IN4			0.71			
IN5			0.44			
IN6			0.63			
TO1				0.68		
TO2				0.69		
TO3				0.59		
TO4				0.59		
TO5				0.73		
TO6				0.62		
TO7				0.61		
TO8				0.55		
CO1					0.49	
CO2					0.47	
CO3					0.59	
CO4					0.61	
CO5					0.58	
CO6					0.73	
CO7					0.61	
CO8					0.61	
EQ1						0.59
EQ2						0.64
EQ3						0.64
EQ4						0.74
EQ5						0.69
EQ6						0.72
EQ7						0.61
EQ8						0.67
% Variance	3.26	5.61	3.64	7.49	4.46	31.22
Eigenvalue	1.56	2.69	1.75	3.59	2.14	14.98

N: 495 students
Factor loadings less than 0.40 have been omitted from the table.
Principal axis factoring with varimax rotation and Kaiser normalization.

The percentage of variance accounted for by the different factors ranged from 3.26% to 31.22%. The total proportion of variance accounted for by the 45 WIHIC items retained in six scales was 55.68%. The largest contribution to variance was for Equity (31.22%). The eigenvalue for each of the six WIHIC scales ranged from 1.56 to 14.98. As recommended by Kaiser (1960), the results indicate that the eigenvalue for each factor is satisfactory because it was greater than 1.

The results of the factor analysis shown in Table 4.1 strongly support the factorial validity of the final 45-item, six-scale version of the WIHIC when used with my sample of 495 middle-school students in Miami-Dade County, Florida. The present study's findings are consistent with past studies which provide evidence supporting the WIHIC's factor structure, including studies conducted in Australia and Canada (Zandvliet & Fraser, 2004), Australia, Canada, and the United Kingdom (Dorman, 2003), Australia and Indonesia (Fraser, Aldridge, & Adolphe, 2010), Australia and Taiwan (Aldridge & Fraser, 2000), India (Koul & Fisher, 2005), Korea (Kim, Fisher, & Fraser, 2000), Singapore (Chionh & Fraser, 2009), South Africa (Aldridge, Laugksch, Seopa, & Fraser, 2006), and the United States (Allen & Fraser, 2007; Pickett & Fraser, 2009; Wolf & Fraser, 2008).

4.2.2 Factor Structure for the Modified Version of the SALES

In the present study, student attitudes were evaluated using the new SALES questionnaire, developed by Velayutham et al. (2011). The instrument was created to economically assess the factors that contribute toward students' adaptive motivated and self-regulated learning engagement in science. The SALES was initially validated among 1,360 students from 78 classes in five public schools in the Perth metropolitan area, Western Australia. Upon validating the instrument, Velayutham et al. (2011, p. 20) concluded: "This survey could be valuable for researchers and teachers because it provides them with an expedient tool for gathering information on important aspects of students' learning engagement in science." A more detailed description of the SALES questionnaire, including a discussion of its four constructs, was provided in Chapter 3, Section 3.6.2. Also discussed in Section 3.6.2 were the modifications made to the WIHIC for purposes of the present study.

The data collected from the 495 students were analyzed to provide statistical validation for the 32-item, four-scale SALES questionnaire. Factor and item analyses were conducted to identify questionnaire items whose removal would improve the internal consistency reliability and factorial validity of each SALES scale. The factor analysis procedures used to validate the SALES mirror the process used to validate the WIHIC, described in Section 4.2.1.

TABLE 4.2 Factor Analysis Results for SALES

Item	Factor Loadings			
	Learning Goal Orientation	Task Value	Self-Efficacy	Self-Regulation
LGO1	0.59			
LGO2	0.62			
LGO3	0.60			
LGO4	0.69			
LGO5	0.65			
LGO6	0.71			
LGO7	0.58			
LGO8	0.66			
TV1		0.67		
TV2		0.65		
TV3		0.64		
TV4		0.66		
TV5		0.71		
TV6		0.68		
TV7		0.61		
TV8		0.60		
SE1			0.63	
SE2			0.77	
SE3			0.72	
SE4			0.66	
SE5			0.50	
SE6			0.59	
SE7			0.67	
SR1				0.61
SR2				0.65
SR3				0.57
SR4				0.63
SR5				0.51
SR6				0.63
SR7				0.54
SR8				0.65
% Variance	8.07	40.85	6.16	4.65
Eigenvalue	2.58	13.07	1.97	1.49

N: 495 students
Factor loadings less than 0.40 have been omitted from the table.
Principal axis factoring with varimax rotation and Kaiser normalization.

To verify the structure of the modified version of the SALES, principal axis factor analysis with varimax rotation and Kaiser normalization was conducted. The factor loadings obtained are reported in Table 4.2. Only loadings of 0.40 or higher are reported in Table 4.2. In order for an item to be retained, its loading on its *a priori* scale needed to be at least 0.40 and its loading on each of the other three SALES scales needed to be less than 0.40.

Of the 128 possible loadings in Table 4.2 (32 items x 4 scales = 128), only one case in the modified four-factor structure failed to meet the criteria for retention. Therefore, a total 31 of the 32 items were retained. Item SE8 had a loading of less than 0.40 on its own scale and, therefore, was omitted from subsequent analyses. Table 4.2 shows that all of the remaining 31 items had a factor loading of 0.40 or greater on their *a priori* scale and less than 0.40 on each of the other three scales. The bottom of Table 4.2 shows that the percentage of variance accounted for by the different factors ranged from 4.65% to 40.85%. The total proportion of variance accounted for by the 31 SALES items in four scales was 59.73%. The largest contribution to variance was for Task Value at 40.85%. The bottom of Table 4.2 also shows that the eigenvalue for each of the four SALES scales ranged from 1.49 to 13.07. As recommended by Kaiser (1960), the eigenvalue for each factor can be considered satisfactory because it was greater than 1.

The results of the factor analysis shown in Table 4.2 strongly support the factorial validity of the final 31-item, four-scale version of the SALES when used with my sample of 495 middle-school students in Miami-Dade. With the exception of Item SE8, the present study's findings are consistent with Velayutham et al.'s (2011) initial validation with a sample of 1,360 students in Grades 8, 9, and 10 in Western Australia, as well as Rogers and Fraser's (2013) subsequent validation with a sample of 431 students in Grades 9 and 10 in South Australia. In both of these preceding studies, the cumulative variance for all four factors was high and the retained items all loaded above 0.50 on their respective factor and did not load on any other factor.

4.2.3 Internal Consistency Reliability of the Modified Versions of the WIHIC and SALES

Internal consistency reliability indicates whether each item in a scale assesses a similar construct, as well as the degree to which respondents' answers to items measuring the same trait are consistent (McMillan, 2008b). Cronbach's alpha coefficient is one type of internal consistency reliability measure that evaluates the unidimensionality of a set of items and indicates how closely related a set of items is as a group (Cronbach, 1951). In the present study, the Cronbach alpha reliability coefficient was used as an index of scale internal consistency. The internal consistency reliability for each WIHIC and SALES scale was calculated with the individual unit of analysis for the whole sample of 495 students. Table 4.3 reports the Cronbach alpha coefficient for each of the six scales of the modified WIHIC and each of the four scales of the modified SALES.

As shown in Table 4.3, the alpha reliability estimate for each scale of the WIHIC ranged from 0.81 to 0.92 with the individual as the unit of analysis. These internal consistency indices from the modified WIHIC are comparable to those obtained when the WIHIC was used in many studies reviewed in Chapter 2 (Section 2.6.2), including with an Australian sample (Fraser et al., 1996), which ranged from 0.67 to 0.88, and with an Indonesian sample (Margianti et al., 2004), which ranged from 0.65 to 0.87. Furthermore, Helding and Fraser (2013) conducted a study using a modified version of the WIHIC in Miami, Florida, the same location as the present study, with a sample of 927 students. Their internal consistency indices ranged from 0.82 to 0.92, an almost precise replica of the indices reported in the present study.

When analyzing each factor to provide an indication of the internal consistency reliability, Cohen et al. (2000) have found 0.60 to be the common lenient cut-off in exploratory research; an alpha of 0.70 or higher indicates a 'satisfactory' scale; and an alpha of 0.80 or higher indicates a 'good' scale. Nunnally (1978) recommended that research instruments have a Cronbach alpha reliability coefficient of 0.70 or higher. Hence, the high Cronbach alpha coefficients reported in Table 4.3 suggest 'good' reliability for the modified version of the WIHIC used in the present study.

For the four scales of the SALES, the alpha reliability estimates ranged from 0.89 to 0.91 with the individual as the unit of analysis. Velayutham et al. (2011), in their initial development and validation of the SALES, reported that the Cronbach alpha coefficient for different factors ranged from 0.91 to 0.92, nearly mirroring the indices reported in the present study. Hence, in accordance with the conventions proffered by Cohen et al. (2000) and Nunnally (1978), the high Cronbach alpha coefficient reported in Table 4.3 for each factor attest to the 'good' reliability of the SALES constructs.

4.2.4 Ability of the WIHIC and SALES to Differentiate Between Classrooms

A one-way ANOVA was used to determine whether each scale of the WIHIC and SALES was able to differentiate between the perceptions of students in different classrooms. ANOVA indicated whether students in the same class perceived their learning environment in a similar way, while mean class perceptions varied from class to class.

TABLE 4.3 Mean, Standard Deviation, Internal Consistency (Cronbach Alpha Reliability) and Ability to Differentiate Between Classrooms (ANOVA Results) for Each Questionnaire Scale

Scale	No. of Items	Unit of Analysis	Mean	SD	Alpha Reliability	Eta^2
WIHIC						
Student Cohesiveness	7	Student	4.07	0.63	0.81	0.09*
		Class	4.09	0.22	0.81	
Teacher Support	8	Student	3.70	0.86	0.89	0.22***
		Class	3.66	0.44	0.93	
Involvement	6	Student	3.35	0.83	0.86	0.12**
		Class	3.41	0.37	0.89	
Task Orientation	8	Student	4.33	0.63	0.87	0.14***
		Class	4.33	0.28	0.92	
Cooperation	8	Student	3.65	0.81	0.85	0.12**
		Class	3.71	0.38	0.89	
Equity	8	Student	4.09	0.89	0.92	0.18***
		Class	4.05	0.42	0.97	
SALES						
Learning Goal Orientation	8	Student	4.56	0.48	0.89	0.08
		Class	4.54	0.19	0.94	
Task Value	8	Student	3.97	0.74	0.91	0.13***
		Class	4.01	0.31	0.93	
Self-Efficacy	7	Student	4.23	0.62	0.89	0.07
		Class	4.25	0.22	0.91	
Self-Regulation	8	Student	4.04	0.68	0.90	0.08
		Class	4.04	0.24	0.90	

*$p<0.05$, **$p<0.01$, ***$p<0.001$ *N*: Students = 495, Classes = 31

The results in the last column of Table 4.3 reveal significant differences ($p<0.05$) between students' perceptions in different classes for all WIHIC scales, as well as for the SALES scale of Task Value, when the student was used as the unit of analysis.

The eta² statistic represents the proportion of variance in scale scores accounted for by class membership. The eta² values reported in the last column of Table 4.3 ranged from 0.09 to 0.22 for the different scales measured by the WIHIC and from 0.07 to 0.13 for the different scales measured by the SALES.

4.3 Giftedness Differences, Sex Differences, and Giftedness–by–Sex Interactions for WIHIC and SALES Scales

The WIHIC and SALES scales, once refined and validated, were employed to test the next research question. The analyses reported in this section involved differences in learning environment and attitudinal scores based on giftedness (Section 4.3.1), sex (Section 4.3.2), and the interaction between giftedness and sex (hereafter referred to as the giftedness–by–sex interaction; Section 4.3.3) for the whole sample of 495 middle-school students in Grades 6, 7, and 8.

A two-way multivariate of analysis (MANOVA) was performed to test giftedness and sex as predictors of scores on the six learning environment scales from the WIHIC and the four attitudinal scales from the SALES. Wilks' (1932) lambda criterion (Λ), a statistic which takes into account both the differences between groups and the cohesiveness or homogeneity within groups (Klecka, 1980), was employed when conducting MANOVA. This test statistic was used to determine whether differences existed between groups for any combination of variables. Because the multivariate tests using Wilks' lambda criterion yielded significant results for the set of dependent variables as a whole, the univariate analysis of variance (ANOVA) was interpreted separately for each individual learning environment and attitudinal scale.

Table 4.4 shows the ANOVA results for each of the learning environment and attitudinal scales for giftedness (gifted versus non-gifted), student sex (males versus females), and the giftedness–by–sex interaction. An overview of Table 4.4 reveals:

- significant differences between gifted and non-gifted students for the learning environment scale of Involvement and the attitudinal scale of Self-Regulation (discussed further in Section 4.3.1); and
- significant differences for sex and a significant giftedness–by–sex interaction for the learning environment scale of Cooperation (discussed further in Section 4.3.2).

Table 4.4 shows the *F* values and the eta² values for each scale for giftedness, sex, and the giftedness–by–sex interaction. The *F* ratio is used to determine whether the variances in two independent samples are equal. The eta² values indicate the effect size in terms of the proportion of variance in a dependent variable explained by an independent variable.

TABLE 4.4 Two-Way ANOVA for Giftedness and Sex Differences for Each WIHIC and SALES Scale

Scales	Giftedness		Sex		Interaction	
	F	Eta^2	*F*	Eta^2	*F*	Eta^2
WIHIC						
Student Cohesiveness	1.96	0.00	0.72	0.00	0.15	0.00
Teacher Support	0.74	0.00	1.27	0.00	1.78	0.03
Involvement	4.02*	0.01	0.22	0.00	3.05	0.00
Task Orientation	0.38	0.00	0.00	0.00	0.36	0.00
Cooperation	0.12	0.00	4.03*	0.01	5.88**	0.01
Equity	0.47	0.01	0.36	0.00	0.38	0.00
SALES						
Learning Goal Orientation	1.43	0.00	0.01	0.00	0.15	0.00
Task Value	1.50	0.00	2.77	0.00	1.72	0.00
Self-Efficacy	1.25	0.00	2.63	0.00	0.83	0.00
Self-Regulation	6.02**	0.00	0.94	0.00	0.00	0.00

*$p<0.05$, **$p<0.01$ *N*: 495 (Gender: Males = 234, Females = 261; Gifted = 238, Non-Gifted = 257)

4.3.1 Differences Between Gifted and Non-Gifted Students in Terms of Classroom Learning Environments and Attitudes

This section presents a discussion of analyses and results pertaining to the first prong of the second research question:

> *Do students' perceptions of their classroom learning environment and attitudes vary with giftedness?*

For the sample of 495 students, there were 238 (48.98%) gifted and 257 (51.92%)

non-gifted students. In this section, analyses for differences between gifted and non-gifted students in terms of learning environment and attitudes are reported.

Table 4.5 reports the average item mean, average item standard deviation, and difference between gifted and non-gifted students for each learning environment and attitudinal scale.

TABLE 4.5 Average Item Mean, Average Item Standard Deviation, and Difference Between Gifted and Non-Gifted Students (ANOVA Results and Effect Sizes) for Each WIHIC and SALES Scale

Scales	Mean		SD		Difference	
	Gifted	Non-Gifted	Gifted	Non-Gifted	*F*	Effect Size
WIHIC						
Student Cohesiveness	4.03	4.11	0.66	0.59	1.96	0.13
Teacher Support	3.66	3.73	0.86	0.86	0.74	0.08
Involvement	3.43	3.28	0.85	0.79	4.02*	-0.18
Task Orientation	4.31	4.35	0.63	0.64	0.38	0.06
Cooperation	3.63	3.67	0.84	0.76	0.12	0.05
Equity	4.06	4.12	0.93	0.86	0.47	0.07
SALES						
Learning Goal Orientation	4.53	4.58	0.49	0.47	1.43	0.10
Task Value	3.93	4.01	0.77	0.71	1.50	0.11
Self-Efficacy	4.27	4.21	0.65	0.58	1.25	-0.10
Self-Regulation	3.96	4.12	0.74	0.62	6.02**	0.23

*$p<0.05$, **$p<0.01$ *N*: 495 (Gifted = 238, Non-Gifted = 257)

The *F* ratios in Table 4.5, taken from the two-way ANOVA results reported in Table 4.4, show that the differences were statistically significant ($p<0.05$) for only one of the learning environment scales and one of the attitudinal scales, namely, Involvement and Self-Regulation, respectively. To allow simple comparison of the average scores on the different scales, the average item mean (scale mean divided by the number of items in that scale) and average item standard deviation for each learning environment and attitudinal scale are reported in Table 4.5 for gifted and non-gifted students.

Table 4.5 also reports the effect size (Cohen's *d*; the difference between the means of gifted and non-gifted student groups divided by the pooled standard deviation) for each learning environment and attitudinal scale. The effect size conveniently expresses a difference between two groups in standard deviation units (Cohen, 1962). According to Cohen (1988), effect sizes range from small (0.2) to medium (0.5) to

large (0.8). The effect sizes in Table 4.5 are consistent with the ANOVA results in that the magnitudes of the differences between gifted and non-gifted students for the two scales for which differences were statistically significant were larger than for the other scales, though still modest (namely, 0.23 standard deviations for Self-Regulation and -0.18 standard deviations for Involvement). Consequently, the magnitude for both Involvement and Self-Regulation suggests that the differences between gifted and non-gifted students are of modest educational significance.

Figure 4.1 graphically represents the differences between gifted and non-gifted students in terms of mean scores on each learning environment and attitudinal scale.

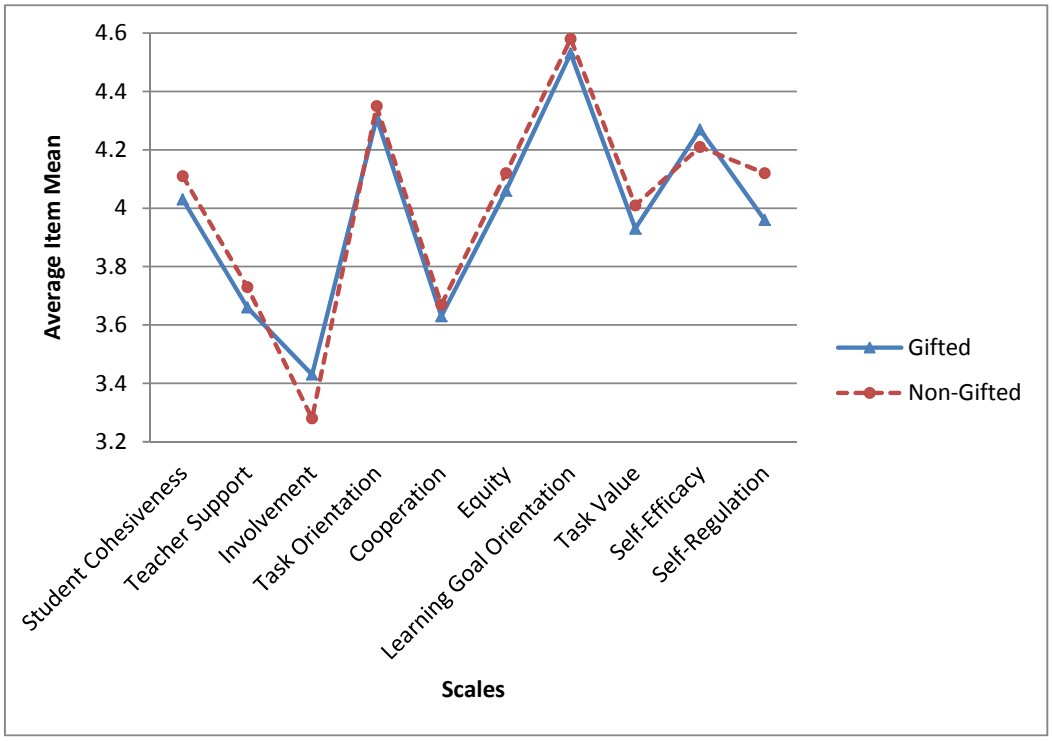


Figure 4.1 Gifted and Non-Gifted Students' Average Item Mean Scores for Learning Environment and Attitudinal Scales

Figure 4.1 further shows that non-gifted students had slightly higher means than gifted students for the majority of scales, with gifted students scoring only marginally higher for the scales of Involvement (gifted mean = 3.43; non-gifted mean = 3.28) and Self-Efficacy (gifted mean = 4.27; non-gifted mean = 4.21). Overall, Figure 4.1 reveals that the differences were small for most scales, while confirming slightly

larger differences for Involvement and Self-Regulation, the two scales for which differences were statistically significant.

4.3.2 Sex Differences in Perceptions of Classroom Learning Environment and Attitudes

This section presents a discussion of analyses and results pertaining to the second prong of the second research question:

> *Do students' perceptions of their classroom learning environment and attitudes vary with sex?*

For the sample of 495 students, there were 234 (47.27%) males and 261 (52.73%) females. In this section, analyses for sex differences in learning environment and attitudes are reported.

Table 4.6 reports the average item mean, average item standard deviation, and difference between male and female students for each learning environment and attitudinal scale.

TABLE 4.6 Average Item Mean, Average Item Standard Deviation, and Difference Between Male and Female Students (ANOVA Results and Effect Sizes) for Each WIHIC and SALES Scale

Scales	Mean		SD		Difference	
	Male	Female	Male	Female	*F*	Effect Size
WIHIC						
Student Cohesiveness	4.04	4.09	0.61	0.63	0.72	0.08
Teacher Support	3.65	3.74	0.85	0.87	1.27	0.10
Involvement	3.33	3.37	0.81	0.84	0.22	0.05
Task Orientation	4.33	4.34	0.63	0.64	0.00	0.01
Cooperation	3.57	3.72	0.87	0.73	4.03*	0.18
Equity	4.07	4.12	0.89	0.91	0.36	0.05
SALES						
Learning Goal Orientation	4.56	4.55	0.50	0.46	0.01	0.02
Task Value	4.03	3.92	0.74	0.75	2.77	0.14
Self-Efficacy	4.28	4.19	0.55	0.67	2.63	0.14
Self-Regulation	4.01	4.07	0.67	0.70	0.94	0.08

*$p<0.05$ *N*: Total 495 students (Male = 234, Female = 261)

The *F* ratios in Table 4.6, taken from the two-way ANOVA results reported in Table 4.4, show the statistical significance of differences between male and female students

for each scale. Table 4.6 reports that sex differences were statistically significant ($p<0.05$) for only one of the learning environment scales, namely, Cooperation.

Table 4.6 also reports the effect sizes (in standard deviation units) for the sex differences for each scale. The table shows that the difference between males and females for Cooperation was 0.18 standard deviations, with females perceiving more classroom cooperation than males. While the magnitude of difference between male and female students for the scale of Cooperation was larger than that of the other scales, the difference is modest. Consequently, this suggests that this difference is of minor educational significance.

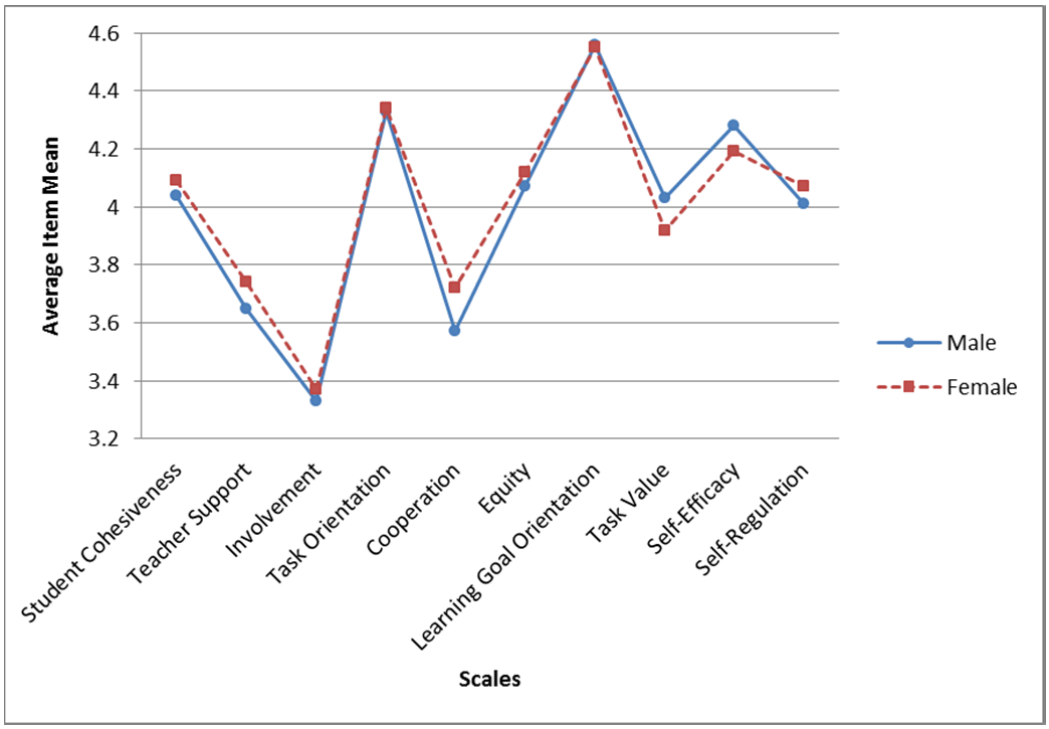


Figure 4.2 Male and Female Students' Average Item Mean Scores for Learning Environment and Attitudinal Scales

Figure 4.2 portrays the mean values for each learning environment and attitudinal scale separately for males and females. This figure graphically represents differences between male and female students. According to Figure 4.2, females perceived their learning environment more positively than males for all learning environment scales, with Cooperation being the only scale for which sex differences were statistically

significant (female mean = 3.72; male mean = 3.57). In terms of the attitudinal scales, males scored only marginally higher on three out of the four SALES scales, namely, Learning Goal Orientation, Task Value, and Self-Efficacy. Females scored only marginally higher on the scale of Self-Regulation. However, sex differences were statistically nonsignificant for attitudinal scales.

4.3.3 Interaction of Giftedness and Sex

This section presents a discussion of analyses and results pertaining to the third prong of the second research question:

> *Do students' perceptions of their classroom learning environment and attitudes vary with the interaction of giftedness and sex?*

For the sample of 495 students, there were 234 (47.27%) males and 261 (52.73%) females. Of the male participants, 114 (48.71%) were gifted and 120 (51.28%) were not gifted. Of the female participants, 124 (47.51%) were gifted and 137 (52.49%) were not gifted.

The *F* ratios reported in Table 4.4 show the statistical significance of the giftedness–by–sex interaction for each scale taken from the two-way ANOVA results. Table 4.4 shows that, for the scale of Cooperation, the giftedness–by–sex interaction was statistically significant. The eta² values of 0.01 suggests that relatively little variance in scores on these scales was attributed to the giftedness–by–sex interaction.

Table 4.7 shows the mean and standard deviation for each learning environment and attitudinal scale for four groups, namely, gifted males, non-gifted males, gifted females, and non-gifted females. The mean scores in Table 4.7 indicate that, whereas gifted males and gifted females had similar Cooperation scores, non-gifted females perceived a noticeably higher level of classroom Cooperation than did non-gifted males. The mean for gifted males of 3.65 was similar to the mean of 3.62 for gifted females. But the mean reported for non-gifted females was 3.82, compared with a mean of 3.50 reported for non-gifted males.

TABLE 4.7 Mean and Standard Deviation for Four Groups for Each WIHIC and SALES Scale

	Male				Female			
	Gifted		Non Gifted		Gifted		Non Gifted	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
WIHIC								
Student Cohesiveness	4.01	0.68	4.07	0.54	4.04	0.65	4.14	0.62
Teacher Support	3.67	0.85	3.63	0.86	3.65	0.88	3.82	0.86
Involvement	3.48	0.87	3.20	0.73	3.38	0.84	3.36	0.84
Task Orientation	4.33	0.57	4.33	0.68	4.30	0.68	4.37	0.59
Cooperation	3.65	0.91	3.50	0.83	3.62	0.78	3.82	0.68
Equity	4.07	0.94	4.07	0.84	4.06	0.92	4.17	0.88
SALES								
Learning Goal Orientation	4.54	0.48	4.57	0.52	4.52	0.51	4.59	0.42
Task Value	4.03	0.79	4.02	0.68	3.83	0.74	4.00	0.74
Self-Efficacy	4.34	0.59	4.22	0.51	4.20	0.70	4.18	0.64
Self-Regulation	3.93	0.73	4.08	0.59	3.99	0.75	4.14	0.65

N: 495 (Males: Gifted = 114, Not Gifted = 120; Females: Gifted = 124, Not Gifted = 137)

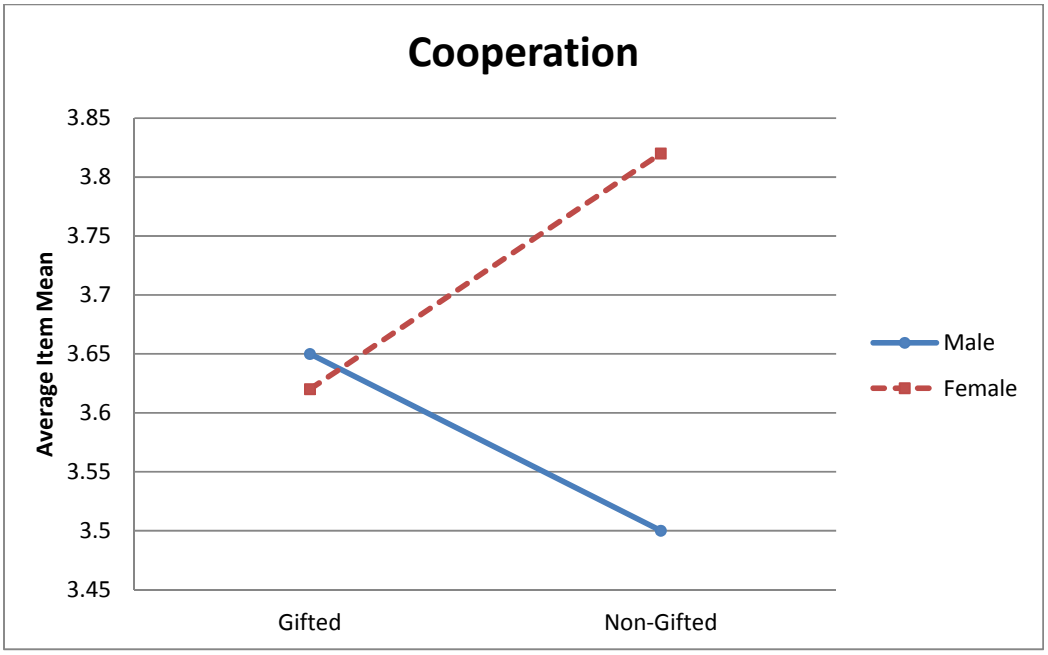


Figure 4.3 Giftedness–by–Sex Interaction for the Learning Environment Scale of Cooperation

The one statistically significant giftedness–by–sex effect for the learning environment scale of Cooperation is clearly depicted in a simplified plot in Figure 4.3. Cooperation scores for non-gifted females (mean = 3.82) are noticeably higher than Cooperation scores for non-gifted males (mean = 3.50). In contrast, Figure 4.3 further illustrates that Cooperation scores for gifted females (mean = 3.62) are marginally lower than Cooperation scores for gifted males (mean = 3.65). On the whole, Figure 4.3 also is consistent with the significant sex differences for Cooperation previously reported in Section 4.3.2.

4.4 Associations Between Learning Environment and Student Attitudes

This section presents the analyses and results pertaining to the third research question:

> *Do associations exist between the classroom learning environment and student attitudes?*

To answer the third research question, I analyzed data from administration of the WIHIC and SALES to the sample of 495 students in 31 classes using two units of statistical analysis (the student and the class mean).

To investigate the relationships between students' perceptions of their learning environment and the student outcome of attitudes, simple correlation (r) and multiple regression analyses were conducted. Simple correlation analysis examined the bivariate relationship between each student outcome (each of the four student attitudinal scales of the SALES) and the six learning environment scales of the WIHIC. Multiple regression analysis was conducted to determine the joint influence of the set of correlated learning environment scales on each SALES scale. The multiple correlation (R) was used to describe the multivariate association between an attitudinal scale and the set of all learning environment scales. The regression coefficient (β) was used to provide information about which environment scales contributed to the variance in students' attitudes when all other environment scales were mutually controlled.

TABLE 4.8 Simple Correlation and Multiple Regression Analyses for Associations Between Learning Environment and Student Attitudinal Scales

Scale	Unit of Analysis		Attitude–Environment Associations							
			Learning Goal Orientation		Task Value		Self-Efficacy		Self-Regulation	
			r	β	*r*	β	*r*	β	*r*	β
Student Cohesiveness	Student		0.30**	0.04	0.30**	0.05	0.34**	0.07	0.34**	0.04
	Class		0.36*	0.24	0.23	0.35	0.71**	0.12	0.44*	0.03
Teacher Support	Student		0.39**	0.15**	0.48**	0.19***	0.36**	0.01	0.38**	0.05
	Class		0.45*	0.34	0.53**	0.37	0.66**	0.20	0.47**	0.05
Involvement	Student		0.22**	0.10*	0.37**	0.07	0.36**	0.15**	0.30**	0.00
	Class		0.27	0.42	0.38*	0.23	0.80**	0.45*	0.51**	0.28
Task Orientation	Student		0.60**	0.52***	0.48**	0.26***	0.45**	0.26***	0.58**	0.46***
	Class		0.69**	0.67**	0.57**	0.49*	0.65**	0.27	0.77**	0.76***
Cooperation	Student		0.29**	0.02	0.35**	0.06	0.31**	0.00	0.35**	0.07
	Class		0.34	0.00	0.25	0.09	0.62**	0.04	0.37*	0.21
Equity	Student		0.41**	0.05	0.49**	0.19***	0.44**	0.20***	0.44**	0.09
	Class		0.39*	0.13	0.41*	0.02	0.57**	0.09	0.44*	0.08
Multiple Correlation	Student	*R*	0.62***		0.59***		0.53***		0.61***	
	Class	*R*	0.73**		0.67*		0.86***		0.79***	

*$p<0.05$, **$p<0.01$, ***$p<0.001$ *N*: 495 students in 31 classes

Table 4.8 reports that, when associations between the learning environment and student attitudes were investigated through correlational analyses, each of the six learning environment scales of the WIHIC was correlated positively and significantly ($p<0.05$) with each of the four attitudinal scales of the SALES for both units of statistical analysis.

Table 4.8 further reports that the multiple correlation between the six learning environment scales of the WIHIC and each attitudinal scale was statistically significant ($p<0.05$) with either the student or the class mean as the unit of analysis. With the student as the unit of analysis, the multiple correlations between the six learning environment scales of the WIHIC and an attitudinal scale of the SALES was 0.62 for Learning Goal Orientation, 0.59 for Task Value, 0.53 for Self-Efficacy, and 0.61 for Self-Regulation. With the class as the unit of analysis, the multiple correlations between the six learning environment scales of the WIHIC and the four attitudinal scales of the SALES was 0.73 for Learning Goal Orientation, 0.67 for Task Value, 0.86 for Self-Efficacy, and 0.79 for Self-Regulation.

Standardized regression coefficients were used to identify which of the six learning environment scales of the WIHIC contributed uniquely and significantly ($p<0.05$) to the variance in the student outcome of attitudes when the other five environment scales were mutually controlled. The regression coefficients in Table 4.8 reveal that:

- Teacher Support was a significant independent predictor of Learning Goal Orientation and Task Value with the student as the unit of analysis.
- Involvement was a significant independent predictor of Learning Goal Orientation and Self-Efficacy with the student as the unit of analysis and Self-Efficacy with the class as the unit of analysis.
- Task Orientation was a significant independent predictor of all four attitude scales with the student as the unit of analysis and three attitude scales with the class as the unit of analysis (with the exception being Self-Efficacy).
- Equity was a significant independent predictor of Task Value and Self-Efficacy with the student as the unit of analysis.

- Student Cohesiveness and Cooperation were significant independent predictors of none of the four attitude scales.

Moreover, the fact that all statistically significant simple correlation and regression coefficients in Table 4.8 are positive suggests a positive link between learning environments and student attitudes. Therefore, the results of the present study replicate much past learning environment research involving attitudes in various countries, including Australia and Canada (Zandvliet & Fraser, 2004, 2005), Australia and Taiwan (Aldridge & Fraser, 2000), Korea (Kim, Fisher, & Fraser, 2000), Singapore (Chionh & Fraser, 2009; Wong & Fraser, 1996), and the United States (Allen & Fraser, 2007; Helding & Fraser, 2013; Ogbuehi & Fraser, 2007; Robinson & Fraser, 2013; Wolf & Fraser, 2008).

In particular, Task Orientation stands out as having the strongest univariate and multivariate associations with all attitudinal scales with both the student and class as the unit of analysis. This replicates the findings of Velayutham et al. (2011) in which Task Orientation also had the greatest influence on students' motivation and self-regulation in Australian classrooms. These findings suggest tentatively that teachers could improve the motivation and self-regulation of their students by addressing the goals of each classroom activity and ensuring that students understand what tasks they are required to complete. For students to succeed in academic tasks, teachers should consider applying 'academic press'— pressure in a learning environment that encourages completion of certain curricula, coursework, and/or academic tasks (Middleton & Midgley, 2002; Phillips, 1997).

My study is unique in that it involved assessing attitudes with the recently developed SALES (Velayutham, 2011). In contrast, since its initial validation in 1977, the TOSRA (Fraser, 1981; see Section 2.7.4) has been used extensively to assess student attitudes in learning environment studies. Numerous researchers in different countries have selected specific scales from the TOSRA to investigate associations between the learning environment and student attitudes. For example, the TOSRA's Enjoyment of Science

scale has been used in: Australia and Taiwan by Aldridge, Fraser, Taylor et al. (2000); Korea by Fraser and Lee (2009); Singapore by Quek et al. (2005); and the United States by Helding and Fraser (2013). Because most past studies of attitude–environment associations have focussed on attitudes that are quite different from the motivation and self-regulation constructs included in my study, additional future research should attempt to replicate the associations found in my study between SALES scales and the learning environment scales of the WIHIC (particularly the strong independent associations between Task Orientation and all SALES scales).

4.5 Summary of the Chapter

This chapter presented and interpreted findings based on analyses of the quantitative data collected in the present study. There were three main purposes of the study, which were (1) to validate the WIHIC and SALES questionnaires; (2) to ascertain whether students' perceptions of their classroom learning environment and attitudes vary with giftedness, sex, and/or the interaction of giftedness and sex; and (3) to determine whether associations exist between the classroom learning environment and student attitudes.

The sample consisted of 495 middle-school students (238 gifted students and 257 non-gifted students) in Grades 6, 7, and 8, in 31 classes, from 10 different school sites within the South Region of the Miami-Dade County Public School District. The data collected were statistically analyzed to answer the specific research objectives delineated in Chapter 1, Section 1.5 and recapitulated in the present chapter.

The first research question concerned the validity of the modified WIHIC and SALES questionnaires. Factor analysis of the modified WIHIC revealed that, except for only three of the possible 288 cases, the original six-factor structure was replicated perfectly. A total of 45 of the original 48 WIHIC items had factor loadings of at least 0.40 on their *a priori* scale and no other scale and, therefore, were retained. The proportion of variance ranged from 3.26% to 31.22% for different WIHIC scales, with a total proportion of variance of 55.68%, and eigenvalues for different scales ranged from 1.56

to 14.98. The internal consistency reliability for different WIHIC scales ranged from 0.81 to 0.92 with the individual student as the unit of analysis. ANOVA revealed significant differences ($p<0.05$) between students' perceptions in different classes for all WIHIC scales. Eta² values ranged from 0.09 to 0.22 for the different learning environment scales.

Overall, the data analyses in the present study supported the modified WIHIC's validity, reliability, and ability to differentiate between classrooms when assessing perceptions of the classroom environment among middle-school students within the large urban school district of Miami-Dade County, Florida. The factor analysis, reliability, and the ability to differentiate between classrooms results replicate past studies that have confirmed the validity of the WIHIC (Aldridge & Fraser, 2000; Chionh & Fraser, 2009; Helding & Fraser, 2013; Ogbuehi & Fraser, 2007; Zandvliet & Fraser, 2004, 2005).

Factor analysis of the modified SALES revealed that only one of the possible 128 cases failed to meet the criteria for retention. A total of 31 of the original 32 items had a factor loading of at least 0.40 on their *a priori* scale and no other scale and, therefore, were retained. The proportion of variance ranged from 4.65% to 40.85% for different SALES sales, with a total proportion of variance at 59.73%, and eigenvalues for different scales ranged from 1.49 to 13.07. The internal consistency reliability for each SALES scale ranged from 0.89 to 0.91 with the individual student as the unit of analysis. ANOVA analyses revealed significant differences ($p<0.001$) between students' perceptions in different classes for the SALES scale of Task Value. Eta² values ranged from 0.07 to 0.13 for the different attitudinal scales.

Overall, the results of the present study supported the modified SALES's validity, reliability, and ability to differentiate between classrooms when assessing attitudes among middle-school students within the large urban school district of Miami-Dade County, Florida. These results for my study replicate those of past studies that have employed the SALES (Rogers & Fraser, 2013; Velayutham et al., 2011).

Once the modified versions of the WIHIC and SALES were found to be valid and reliable with my sample, the data gathered during the validation stage were statistically analyzed further to investigate the second research question. The second research question involved whether students' perceptions of their classroom learning environment and attitudes varied with giftedness, sex, and/or giftedness–by–sex interactions. In order to test giftedness and sex as predictors of scores on the WIHIC and SALES scales, a two-way MANOVA was performed. Because the multivariate tests using Wilks' lambda criterion yielded significant results for the set of dependent variables as a whole, ANOVA results were interpreted separately for each individual WIHIC and SALES scale. The results indicated significant differences between gifted and non-gifted students for the learning environment scale of Involvement (effect size of -0.18 standard deviations) and the attitudinal scale of Self-Regulation (effect size of 0.23 standard deviations).

For the learning environment scale of Cooperation, both the sex effect and the giftedness–by–sex interaction were statistically significant ($p<0.05$). Whereas gifted males and gifted females had similar Cooperation scores, non-gifted females perceived a noticeably higher level of classroom cooperation (mean = 3.82) than did their non-gifted male counterparts (mean = 3.50).

To answer the third research question, simple correlation and multiple regression analyses were conducted at two units of analysis (individual and class mean) in order to investigate the relationships between students' perceptions of their learning environment and the student outcome of attitudes. The simple correlation analysis revealed that all six learning environment scales of the WIHIC correlated positively and significantly ($p<0.05$) with the four attitudinal scales of the SALES for both units of analysis. With either the student or the class as the unit of analysis, the multiple correlation between the set of six learning environment scales of the WIHIC and each attitudinal scale of the SALES was statistically significant ($p<0.001$).

Examination of the regression coefficients revealed that: Student Cohesiveness and Cooperation were not significant independent predictors of any attitudinal scale; Task Orientation was a significant independent predictor of all four attitudinal scales with the student as the unit of analysis and three attitudinal scales (with the exception being Self-Efficacy) with the class as the unit of analysis; and Teacher Support, Involvement, and Equity were significant independent predictors of one or more SALES scales for at least one unit of analysis.

Both the simple correlation and multiple regression analyses revealed positive associations between the six WIHIC scales and the four SALES scales, thus replicating much prior research that has consistently revealed a positive link between student attitudes and their learning environment (Fraser, 2012). It is noteworthy that Task Orientation had the strongest univariate and multivariate associations with all attitudinal scales with both the student and class as the unit of analysis, which replicates research in Australia by Velayutham et al. (2011).

Chapter 5, the next and final chapter of this thesis, discusses the present study's findings, distinctive contributions to the field of learning environments, and limitations. Recommendations for future research are also proffered.

Chapter 5

DISCUSSION AND CONCLUSION

The open mind never acts: when we have done our utmost to arrive at a reasonable conclusion, we still, when we can reason and investigate no more, must close our minds for the moment with a snap, and act dogmatically on our conclusions.

–George Bernard Shaw

5.1 Introduction

This study compared gifted and non-gifted middle-school students in terms of their classroom learning environments and attitudes within the largest, southern-most region of the Miami-Dade County Public School District. The previous chapters in this thesis presented a rationale for the study and research objectives (Chapter 1), the literature that supported this study (Chapter 2), the methods employed for data collection and analysis (Chapter 3), and the results of the data analyses (Chapter 4).

In the current chapter, Section 5.2 presents an overview of this thesis. Section 5.3 summarizes the major findings of the study. Section 5.4 discusses the educational significance of the study. Limitations of the study are noted in Section 5.5. Recommendations for further research are discussed in Section 5.6. Lastly, Section 5.7 provides a conclusion to this thesis.

5.2 Overview of the Thesis

Chapter 1 presented an introduction to this thesis. Section 1.2 provided background information about the context in which the study was conducted, specifically about Miami-Dade County, Florida. Section 1.3 presented the theoretical underpinnings of the study. Section 1.4 outlined the study's three specific research objectives of the study:

- To investigate whether the revised What Is Happening In this Class? (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) questionnaires are valid and reliable for assessing classroom learning environments and attitudes, respectively, when used with middle-school students within the large urban school district of Miami-Dade County, Florida.
- To investigate whether students' perceptions of their classroom learning environment and attitudes vary with giftedness, sex, and/or the interaction of giftedness and sex.
- To investigate whether associations exist between the classroom learning environment and student attitudes.

Next, Section 1.5 addressed the scholarly and practical significance of the study. Lastly, Section 1.6 provided a structural overview of the remaining chapters comprising this thesis.

Chapter 2 reviewed literature relevant to the current study. Section 2.2 discussed the field of gifted education, including the historical background of human intelligence testing, curriculum and instruction, gifted and non-gifted pedagogies, and an overview of the current state of gifted education in the United States. Section 2.3 focused on the extensive history of the field of learning environments, commencing with the work of Lewin (1936) and Murray (1938). Section 2.4 reviewed eight noteworthy questionnaires frequently used to assess classroom learning environments: LEI, CES, ICEQ, MCI, CUCEI, QTI, SLEI, and CLES. Each questionnaire's conceptualization, development, validation, and use were discussed in this section.

Section 2.5 examined the various types of research conducted in the field of learning environments, including associations between student outcomes and the classroom environment. Section 2.5 also explored differences between student and teacher perceptions of actual and preferred environment, determinants of classroom environments, use of qualitative research methods, and cross-national studies (especially throughout Asia).

Section 2.6 was devoted to a discussion of the conceptualization and development of the instrument used in the present study to assess learning environments, the What Is Happening In this Class? (WIHIC) questionnaire. This section described the WIHIC's scales, reviewed past studies that have used the WIHIC, and affirmed the questionnaire's reliability and cross-cultural validity. Section 2.7 presented a review of literature on the field of attitudes, placing particular attention on students' motivation (including the components of learning goal orientation, task value, and self-efficacy) and self-regulation. Furthermore, this section reviewed the LASSI, MSLQ, and TOSRA—instruments commonly used to investigate student attitudes—that paved the way for the development of the SALES (used in the present study to measure salient factors related to motivation and self-regulation).

Finally, Section 2.8 reviewed sex differences pertaining to the fields of gifted education and learning environments. On the whole, research has shown that females generally hold somewhat more favorable perceptions of their classroom learning environments than males in the same classes.

Chapter 3 discussed the methodology and instrumentation of the present study. Section 3.2 recapitulated the study's three main research objectives. Section 3.3 described the pilot study that was conducted in order to ensure the face validity and smooth administration of the questionnaires. Based on respondent feedback, gained through qualitative methods, minor modifications to the questionnaires were made (see Section 3.6.1 for the WIHIC and Section 3.6.2 for the SALES). Section 3.4 discussed background information and particulars about the selection of the sample. In all, the present study's sample consisted of 495 middle-school students (238 gifted students and 257 non-gifted students) in Grades 6, 7, and 8, in 31 classes from 10 different schools. Additionally, respondents were:

- aged 11 to 15 years
- enrolled in advanced-level classes
- assigned to heterogeneous classrooms

- enrolled in a middle school or K–8 Center within the South Region of the Miami-Dade County Public School District
- enrolled in their respective institutions for at least 20 weeks
- enrolled in a school that was designated 'Title I' by the Florida Department of Education's Bureau of Federal Educational Programs.

This section also outlined the process of differentiating gifted and non-gifted student respondents for the purpose of the present study. Furthermore, this section detailed the two gifted entry thresholds, referred to as Plan A and Plan B, for the Miami-Dade County Public School District.

The target sample size included allowance for attrition, misadventure, and other potentially hampering circumstances.

Section 3.5 addressed ethical considerations pertaining to this research study, particularly involving the participation of minors. The ethical guidelines set forth by Curtin University's Human Research Ethics Committee and the Miami-Dade County Public School District's Department of Research Services were adhered to at all times.

Section 3.6 presented rationales for the selection of the WIHIC and SALES questionnaires. Questionnaire surveys were selected because they have proven highly valid and efficient for data collection with a large number of respondents and lend themselves to quantitative analysis.

The WIHIC questionnaire was employed for the purpose of investigating learning environments in this study. Of the questionnaire's seven original scales, six were used in this study. Each scale was comprised of eight items and assessed students' perceptions of six dimensions: Student Cohesiveness, Teacher Support, Involvement, Task Orientation, Cooperation, and Equity. The WIHIC has consistently been found valid and reliable when used with secondary school students in numerous studies around the world (Fraser,

2012), particularly in Miami-Dade County where the present study was conducted (Allen & Fraser, 2007; Helding & Fraser, 2013; Pickett & Fraser, 2009).

The SALES questionnaire was employed for the purpose of investigating student attitudes, specifically adaptive motivated and self-regulated learning engagement. The SALES questionnaire included four scales, with eight items in each scale, and assessed students' perceptions of four dimensions: Learning Goal Orientation, Task Value, Self-Efficacy, and Self-Regulation. The SALES is based on a comprehensive analysis of literature that ensures sound theoretical underpinnings, which made it an appropriate instrument for this study. Although new, the instrument has been validated recently in Adelaide, South Australia (Rogers & Fraser, 2013) and Perth, Western Australia (Velayutham et al., 2011).

Section 3.6 further introduced the research model applied to this study, theoretically linking the learning environment scales of the WIHIC to the attitudinal scales of the SALES.

The process of collecting data via the Internet-based program SurveyMonkey was discussed in Section 3.7. This electronic application minimized the potential of human error and was well-received by student respondents.

Section 3.8 described the statistical analyses used to answer the research questions. The quantitative data were analyzed in numerous ways in order to make this possible. To answer the first research question, concerning the validity and reliability of the WIHIC and SALES questionnaires, principal axis factor analysis with varimax rotation and Kaiser normalization was conducted. The Cronbach alpha reliability coefficient was used as an index of scale internal consistency. Lastly, an ANOVA was used to determine the ability of each WIHIC and SALES scale to differentiate between perceptions of students in different classrooms. The eta² statistic, representing the proportion of variance in scale scores accounted for by class membership, was also calculated.

To answer the second research question, concerning whether students' perceptions of their classroom learning environment and attitudes varied with giftedness, sex, and/or the interaction of giftedness and sex, MANOVA was performed for scales from the WIHIC and the SALES. Because the multivariate test using Wilks' lambda criterion yielded significant results for the set of dependent variables as a whole, the ANOVA was interpreted separately for each dependent variable.

To answer the third research question, concerning associations between students' perceptions of their learning environment and attitudes, simple correlation and multiple regression analyses were conducted at two units of analysis (individual and class mean). The multiple correlation was used to describe the multivariate association between an attitudinal scale and the set of all learning environment scales. Regression coefficients were used to provide information about which environment scales contributed to variance in students' attitudes when all other environment scales were mutually controlled.

5.3 Summary of the Results

Results for the first research question, regarding the validity and reliability of the WIHIC and SALES questionnaires, are discussed in Section 5.3.1. Results for the second research question, regarding whether students' perceptions of their classroom learning environment and attitudes varied with giftedness, sex, and/or the interaction of giftedness and sex, are discussed in Section 5.3.2. Finally, results for the third research question regarding associations between students' perceptions of their learning environment and attitudes are discussed in Section 5.3.3.

5.3.1 Research Question 1

Research Question 1:

> *Are the revised What Is Happening In this Class? (WIHIC) and Students' Adaptive Learning Engagement in Science (SALES) questionnaires valid and reliable for assessing classroom learning environments and attitudes, respectively, when used with middle-school students within the large urban school district of Miami-Dade County, Florida?*

The findings related to this research question are discussed under the following sub-headings:

- Validity and Reliability of the WIHIC (Section 5.3.1.1)
- Validity and Reliability of the SALES (Section 5.3.1.2).

5.3.1.1 Validity and Reliability of the WIHIC

The data collected from the 495 students were analyzed to provide statistical validation for the 48-item, six-scale version of the WIHIC questionnaire. To verify the structure of the modified version of the WIHIC, principal axis factor analysis with varimax rotation and Kaiser normalization was conducted. The retained items had loadings above 0.40 on their *a priori* scale, ranging from 0.42 to 0.75, and less than 0.40 on each of the other five scales. Therefore, a total of 45 of the original 48 items were retained.

The percentage of variance accounted for by the different factors ranged from 3.26% to 31.22%. The total proportion of variance accounted for by the 45 WIHIC items retained in six scales was 55.68%. The largest contribution to variance was for Equity (31.22%). The eigenvalue for each of the six WIHIC scales ranged from 1.56 to 14.98.

The alpha reliability estimate for each scale of the WIHIC ranged from 0.81 to 0.92 with the individual as the unit of analysis. These high Cronbach alpha coefficients suggest 'good' reliability for the modified WIHIC used in the present study.

A one-way ANOVA was used to determine whether each scale of the WIHIC was able to differentiate between the perceptions of students in different classrooms. Significant differences ($p<0.05$) between students' perceptions in different classes for the WIHIC scales of Teacher Support, Task Orientation, and Equity were found when the student was used as the unit of analysis. The eta² statistic, representing the proportion of variance in scale scores accounted for by class membership, ranged from 0.09 to 0.22 for the different scales measured by the WIHIC.

These results strongly support the reliability and factorial validity of the final 45-item, six-scale version of the modified WIHIC. The present study's findings are consistent with past studies that have employed the WIHIC in various countries, including: Australia (Dorman, 2008), Australia and Canada (Zandvliet & Fraser, 2004, 2005), Australia and Indonesia (Fraser, Aldridge, & Adolphe, 2010), Australia and Taiwan (Aldridge & Fraser, 2000), Australia, the United Kingdom, and Canada (Dorman, 2003), India (Koul & Fisher, 2005), Indonesia (Wahyudi & Treagust, 2004), Korea (Kim, Fisher, & Fraser, 2000), Singapore (Chionh & Fraser, 2009; Khoo & Fraser, 2008), South Africa (Aldridge, Fraser, & Ntuli, 2009), the United Arab Emirates (Afari et al., 2013; MacLeod & Fraser, 2010), and the United States (Allen & Fraser, 2007; den Brok et al., 2006; Helding & Fraser, 2013; Martin-Dunlop & Fraser, 2007; Ogbuehi & Fraser, 2007; Pickett & Fraser, 2009; Robinson & Fraser, 2013; Wolf & Fraser, 2008).

5.3.1.2 Validity and Reliability of the SALES

The data collected from 495 students for the 32-item, four-scale SALES questionnaire were subjected to similar factor analysis procedures as the WIHIC (described in Section 5.3.1.1). Of the 128 possible loadings, only one case for the original seven-factor structure was not replicated, leaving a total 31 of the 32 items.

All of the remaining 31 items had a factor loading of 0.40 or greater on their *a priori* scale and less than 0.40 on each of the other three scales. The percentage of variance accounted for by the different factors ranged from 4.65% to 40.85%. The total proportion of variance accounted for by the 31 SALES items in four scales was 59.73%. The largest contribution to variance was for Task Value at 40.85%. The eigenvalue for each of the four SALES scales ranged from 1.49 to 13.07.

For the four scales of the SALES, the alpha reliability estimates ranged from 0.89 to 0.91 with the individual as the unit of analysis. These high Cronbach alpha coefficients suggest 'good' reliability for the modified SALES used in the present study.

A one-way ANOVA was used to determine whether each scale of the SALES was able to differentiate between the perceptions of students in different classrooms. Significant differences ($p<0.001$) between students' perceptions in different classes for Task Value were found when the student was used as the unit of analysis. The eta² values ranged from 0.07 to 0.13 for the different scales measured by the SALES.

These results strongly support the reliability and factorial validity of the final 31-item, four-scale modified version of the SALES. The present study's findings are consistent with past studies that have employed the SALES in Australia (Rogers & Fraser, 2013; Velayutham et al., 2011).

5.3.2 Research Question 2

Research Question 2:

> *Do students' perceptions of their classroom learning environment and attitudes vary with:*
> *(a) giftedness*
> *(b) sex*
> *(c) the interaction of giftedness and sex?*

MANOVA was first performed to test giftedness and sex as predictors of scores on the six learning environment scales from the WIHIC and the four attitudinal scales from the SALES. Because the multivariate tests using Wilks' lambda criterion yielded significant results for the set of dependent variables as a whole, the univariate ANOVA was interpreted separately for each individual learning environment and attitudinal scale.

The findings related to this research question are discussed under the following sub-headings:

- Differences Between Gifted and Non-Gifted Students in Terms of Classroom Learning Environments and Attitudes (Section 5.3.2.1)
- Sex Differences in Perceptions of Classroom Learning Environment and Attitudes (Section 5.3.2.2)
- Interaction of Giftedness and Sex (Section 5.3.2.3).

5.3.2.1 Differences Between Gifted and Non-Gifted Students in Terms of Classroom Learning Environments and Attitudes

For the sample of 495 students, there were 238 (48.98%) gifted and 257 (51.92%) non-gifted students. The results of the ANOVA revealed that the differences between gifted and non-gifted students were statistically significant ($p<0.05$) for only one of the learning environment scales and one of the attitudinal scales, namely, Involvement and Self-Regulation, respectively. The effect sizes for Involvement (0.23 standard deviations) and Self-Regulation (-0.18 standard deviations) were larger than for the other scales, though still modest.

Collectively, non-gifted students had marginally higher means than gifted students for the majority of scales.

5.3.2.2 Sex Differences in Perceptions of Classroom Learning Environment and Attitudes

For the sample of 495 students, there were 234 (47.27%) males and 261 (52.73%) females. The results of the ANOVA revealed that the differences between male and female students were statistically significant ($p<0.05$) for only one of the learning environment scales, namely, Cooperation (female mean = 3.72; male mean = 3.57). The effect size (in standard deviation units) for the difference between males and females for Cooperation was 0.18 standard deviations, with females perceiving more classroom cooperation than males. While the magnitude of difference between male and female students for the scale of Cooperation was larger than that of the other scales, the difference was modest.

In terms of the attitudinal scales, males scored only marginally higher on three out of the four SALES scales, namely, Learning Goal Orientation, Task Value, and Self-Efficacy. Females scored only marginally higher on the scale of Self-Regulation. However, sex differences for all attitudinal scales were statistically nonsignificant.

5.3.2.3 Interaction of Giftedness and Sex

For the sample of 495 students, there were 234 (47.27%) males and 261 (52.73%) females. Of the male participants, 114 (48.71%) were gifted and 120 (51.28%) were non-gifted. Of the female participants, 124 (47.51%) were gifted and 137 (52.49%) were non-gifted. In this section, analyses and results pertaining to associations between the classroom learning environment and student attitudes are summarized.

ANOVA results revealed a statistically significant giftedness–by–sex interaction for the scale of Cooperation. The eta² values of 0.01 suggested that relatively little variance in scores on these scales was attributed to this interaction. Cooperation scores for non-gifted females (mean = 3.82) were noticeably higher than Cooperation scores for non-gifted males (mean = 3.50). In contrast, Cooperation scores for gifted females (mean = 3.62) were marginally lower than Cooperation scores for gifted males (mean = 3.65). On the whole, these results are consistent with the significant sex differences found for Cooperation (as summarized in Section 5.3.2.2).

5.3.3 Research Question 3

Research Question 3:

> *Do associations exist between the classroom learning environment and student attitudes?*

To answer the third research question, I analyzed data from administration of the WIHIC and SALES to the sample of 495 students in 31 classes. Simple correlation and regression analyses were undertaken at two units of analysis (individual and class mean) to investigate the relationships between students' perceptions of their learning environment and the student outcome of attitudes. The simple correlation analysis revealed that each of the six learning environment scales of the WIHIC was correlated positively and significantly ($p<0.01$) with each of the four attitudinal scales of the SALES.

Furthermore, the multiple correlation between the six learning environment scales of the WIHIC and each attitudinal scale was statistically significant ($p<0.05$) with either the

student or the class mean as the unit of analysis. Examination of the regression coefficients revealed that: Student Cohesiveness and Cooperation were not significant independent predictors of any attitudinal scale; Task Orientation was a significant independent predictor of all four attitudinal scales with the student as the unit of analysis and three attitudinal scales (with the exception being Self-Efficacy) with the class as the unit of analysis; and Teacher Support, Involvement, and Equity were significant independent predictors of one or more SALES scales for at least one unit of analysis.

Both the simple correlation and multiple regression analyses revealed positive associations between the six WIHIC scales and the four SALES scales, thus replicating much prior research that has consistently revealed a positive link between student attitudes and their learning environment (Fraser, 2012). It is noteworthy that Task Orientation had the strongest univariate and multivariate associations with all attitudinal scales with both the student and class as the unit of analysis, which replicates research in Australia by Velayutham et al. (2011).

5.4 Educational Significance

While past research related to instructional and curricular differentiation of gifted education has predominantly concentrated on teachers' perspectives (e.g. Archambault et al., 1993; Moon et al., 1995; Reis et al., 1998; Westberg et al., 1993), much can still be gained from evaluating the experiences of students. Hence, this study is distinct in that it compared the perceptions of gifted and non-gifted students in terms of their learning environment and attitudes.

In 2011, as previously discussed in Section 2.2, the United States federal appropriations for gifted education were depleted as part of a final continuing resolution to withdraw financial support (U.S. House of Representatives, 2011). Concurrently, because of the enactment of Florida legislation that governs public school class size (Laws of Florida, 2003), funding for gifted education decreased at the local level, thereby compounding the preexisting budgetary challenges faced by schools in Miami-Dade County. For example,

in the 2010–2011 school year, the student–to–teacher ratio for a middle-school gifted class was 15.41 students to one teacher (Miami-Dade County Public Schools, 2010). One year later, in the 2011–2012 school year, gifted class size was based upon an increased ratio of 22 students to one teacher (Miami-Dade County Public Schools, 2011). Moreover, given that the funding structure for the allocation of gifted teaching positions is formulaically generated based upon student enrollment, schools with modest gifted populations, such as the ones selected for participation in this study, have opted to provide necessary instructional services to gifted students in non-traditional ways. The 'quick fix', so to speak, has been to assign gifted students to regular, heterogeneous, mainstream classes for core academic subjects. In doing so, the burden of implementing curricular modifications and differentiating instruction for gifted students rests on the individual teacher, which often presents obstacles (Tomlinson, 1997; VanTassel-Baska & Stambaugh, 2005). Also of concern is that the practice of grouping gifted students with non-gifted students disregards significant research that supports the benefits of homogeneous grouping (Adams-Byers et al., 2004; VanTassel-Baska & Brown, 2007). Tomlinson (1997) poignantly argued that past research (e.g. Delcourt, Loyd, Cornell, & Goldberg, 1994; Kulik & Kulik, 1987; Moon, Tomlinson, & Callahan, 1995) has indicated that challenging gifted learners in heterogeneous, regular classrooms could be more delusion than dream.

Thus, in addition to the three main research objectives, this study was undertaken to provide insight into whether the process of assigning gifted and non-gifted middle-school students to the same classroom disenfranchised gifted students in any way, as reflected in their perceptions of learning environment and attitudes. However, despite the rhetoric and research supporting fundamental differences between gifted and non-gifted students, this study revealed little difference. The only significant differences found between gifted and non-gifted students were for the learning environment scale of Involvement and the attitudinal scale of Self-Regulation (see Section 4.3.1).

There are seemingly two possible explanations as to why the number of differences was limited. One explanation might be that the majority of gifted students who participated in

this study were identified as gifted under the Plan B Matrix, which requires that they be a member of an underrepresented group and score a minimum of 112 on an IQ test. Perhaps Plan B students perceive their learning environment and attitudes more similarly to non-gifted students than to students identified as gifted under the traditional Plan A structure, which requires that students score a minimum of 130 on an IQ test. The second possible rationale is that the teachers of this study's respondents were actively differentiating the curriculum and instruction within their heterogeneous classrooms. Of course, validating either of these hypotheses would require further research. (Section 5.6 outlines recommendations for further research in greater detail.)

Nonetheless, this study contributed to the field of learning environments by validating the WIHIC among gifted and non-gifted middle-school students in Miami-Dade County, Florida. As well, it is noteworthy in that it cross-validated the SALES for the first time in the United States, opening the door for its use to assess the motivation and self-regulation of students in future studies. Moreover, this study innovatively used learning environment criteria to compare gifted and non-gifted students by shifting the investigative lens from teachers to students. Fraser (1991) has found that questioning students about their perceptions presents an advantage over observations of teachers in that it receives input from a much larger sample and is based on many hours of experiential observations by students. The present study established that the methods used can make useful contributions to the fields of gifted education and learning environments.

Also of educational significance is the context of this study. In 2012, the Miami-Dade County Public School District was awarded the Broad Prize for Urban Education—presented to a school district in the United States that has made the greatest progress in raising student achievement. Hence, conducting a study in this school district was fitting and meaningful; the results hopefully will have useful implications for the national educational community at large and encourage further research in the fields of gifted education and learning environments.

5.5. Limitations of the Study

The student sample in this study consisted of 495 middle-school students in Grades 6, 7, and 8 in 31 classes from 10 different schools. All students were enrolled in a middle school or a K–8 Center within the South Region of the Miami-Dade County Public School District. Additionally, all participating schools had student populations with similar racial and socioeconomic status demographics and were designated 'Title I' by the Florida Department of Education's Bureau of Federal Educational Programs. As discussed in Section 3.4, the sample size was limited by the stringent criteria requiring that gifted students be assigned to heterogeneous classrooms. Therefore, the findings of this study should be applied with caution to other and broader groups. Conducting further research (as discussed in Section 5.6), with a larger sample, is recommended.

Although 11 schools met the established criteria for participation in this study, research could not be conducted at one of the schools because of the school principal's denial of consent. District protocol establishes that the principal is 'gatekeeper' of his or her respective school; consent is compulsory in order to conduct research. However, given that this non-participating school had only 27 potentially eligible gifted students, this limitation can be considered minor.

Another limitation of this study involved the inaccessibility to students' individual cumulative school records. Without gaining access to these records, this study was unable to distinguish between students who entered into the gifted program via Plan A from those who entered via Plan B. Because the school district's computerized records do not always indicate the applied eligibility plan for gifted students (as a result of clerical oversight or negligence), the complete paper records would need to be retrieved. The acquisition of these data would require additional levels of school district and parental consent and would be cumbersome for an individual researcher.

Lastly, this study involved obtaining quantitative data by means of students responding to the WIHIC and SALES questionnaires. While qualitative methods were used in the

validation of the modified SALES questionnaire, I acknowledge that the overall complementary nature of a mixed-methods study, incorporating methods such as interviews and observations, could have yielded richer data related to student responses and/or the relevant pedagogical strategies employed by teachers of gifted students. Moreover, the introduction of qualitative methods could stand to improve the validity of research findings (Mathison, 1988). The potential benefits of incorporating qualitative components in this research are discussed at greater length in Section 5.6.

5.6 Recommendations for Further Research

Because several of the predicted findings in this study were not supported, future research is needed to determine the cause of these anomalies. However, it is important to note that, while the limitations discussed in Section 5.5 should not detract from the worthwhile contributions of this study, further research on this topic should take these limitations under advisement. Accordingly, the following recommendations should be considered for future studies:

- Increase the size of the sample, expanding from a regional study to a district-wide study. A larger sample could improve the generalizability of the findings.
- Conduct a comparative study with Plan A and Plan B gifted students to determine differences between these sub-populations. This could further illuminate the present study's initial findings.
- In addition to investigating the student outcome of attitudes, include a broader range of student outcomes. With the increased emphasis on test scores of late, investigating the student outcome of achievement, for example, would be both relevant and useful.
- Include qualitative data (e.g. student interviews, teacher interviews, and classroom observations) to triangulate research methods and data and possibly enhance findings. The term 'triangulation' was coined by Webb et al. (1966), explicated by Denzin (1970, 1978), and later defined by Cohen, Manion, and Morrison (2011) as an "attempt to map out, or explain more fully, the richness and complexity of human behavior by studying it from more than one standpoint"

(p. 195). In future studies, triangulation could assist in the elimination of bias and allow the dismissal of plausible rival explanations (Campbell & Fiske, 1959; Denzin, 1978; Webb, Campbell, Schwartz, & Sechrest, 1966). While questionnaire data are able to provide evidence of patterns among large populations, qualitative data often yield more in-depth insights into participant attitudes, thoughts, and actions (Kendall, 2008). Patton (2002) proffered that a mixture of quantitative and qualitative data provide a way to elaborate and contextualize statistical 'facts'. Questionnaires and interviews are often used together in mixed-method evaluation studies investigating educational assessment (Brookhart & Durkin, 2003; Lai & Waltman, 2008). In future research growing out of the present study, qualitative research methods could assist with investigating whether curriculum and/or instructional modifications are being made for gifted students who are assigned to heterogeneous, mainstream classes. Overall, the merits of combining qualitative and quantitative methods in learning environment research have been established by Tobin and Fraser (1998) and Aldridge, Fraser, and Huang (1999).

5.7 Conclusion

The present study was undertaken in order to investigate three central objectives: (1) to validate the WIHIC and SALES questionnaires; (2) to ascertain whether students' perceptions of their classroom learning environment and attitudes varied with giftedness, sex, and/or the interaction of giftedness and sex; and (3) to determine whether associations existed between the classroom learning environment and student attitudes.

Overall, the results of the present study supported the validity and reliability of the modified WIHIC and SALES, as well the instruments' ability to differentiate between classrooms. Significant but modest differences between gifted and non-gifted students emerged for the learning environment scale of Involvement and the attitudinal scale of Self-Regulation. For the learning environment scale of Cooperation, both the sex effect and the giftedness–by–sex interaction were statistically significant. Lastly, associations

between students' perceptions of their learning environment and the student outcome of attitudes were also found.

A major contribution of this study is that it provides educational researchers with further evidence of the reliability and validity of the WIHIC and cross-validated the SALES, previously used only in Australia, for the first time in the United States. This study has confirmed that the WIHIC and SALES function in the manner for which they were designed and are adaptable to gifted and non-gifted middle-school students in Miami-Dade County, Florida, which was the context of this study.

Another important contribution of this study to the field of learning environments research is that it identified associations between gifted and non-gifted middle-school students' perceptions of their learning environment and their attitudes. In particular, Task Orientation was the strongest independent predictor of all four attitudinal scales.

The findings of this study have implications for educational researchers, as well as educational practitioners, interested in improving the learning environments of students. The findings from this study will hopefully propel others to contribute to the limited volume of educational data concerning differences between gifted and non-gifted students in their perceptions of learning environments and attitudes.

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APPENDICES

Miami-Dade County Public Schools
Plan B: District Plan to Increase the Participation of Underrepresented Students in the Program for Gifted Students
2012-2013

Gifted State Board Rule

State Board Rule 6A-6.03019, FAC, *Special Instructional Programs for Students Who Are Gifted*, defines a gifted student as one who has superior intellectual development and is capable of high performance. The criteria for eligibility under this rule requires that students meet the criteria under paragraph (a) or (b) of this rule.

(a) The student demonstrates:

1. Need for a special program.
2. A majority of characteristics of gifted students according to a standard scale or checklist, and
3. Superior intellectual development as measured by an intelligence quotient of two (2) standard deviations or more above the mean on an individually administered standardized test of intelligence.

(b) The student is a member of an under-represented group and meets the criteria specified in an approved school district plan for increasing the participation of under-represented groups in programs for gifted students. For the purpose of this rule, under-represented groups are defined as groups:

- Who are limited English proficient, or
- Who are from a low socio-economic status family.

District Plan

Miami-Dade County Public Schools' vision of gifted education is to provide access to excellence. Through the Division of Advanced Academic Programs, the mission is to nurture academically talented students through programs that provide for the maximum development of each student's academic talents as demonstrated by a need for differentiated services, successful classroom performance, and educational opportunities that are challenging, accelerated, enriched, and innovative. The goal of the *District Plan to Increase the Participation of Underrepresented Students in the Gifted Program* is to reflect a proportionate participation of limited English proficient students and students from low socio-economic status families, as measured by students' eligibility for the government-subsidized free and reduced lunch program, by ensuring equal and equitable access for these students to gifted programs and educational services.

Gifted Plan B Matrix

Miami-Dade County Public Schools' *District Plan to Increase the Participation of Underrepresented Students in the Gifted Program* (Gifted Plan B Matrix) utilizes four indicators of giftedness to determine eligibility for students in underrepresented groups:

•The Gifted Characteristics Checklist is used to determine students' verbal, learning, motivational, and social/leadership abilities. The Gifted Characteristic Checklists used in M-DCPS are developmentally appropriate for K-12 students based on current research and scored using a Likert-scale. The M-DCPS Gifted Characteristic

Checklists (FM 7051) are available through the Employee Portal under *Records and Forms*.

•A variety of standardized academic achievement test data is used in the M-DCPS Gifted Plan B Matrix depending on the student's grade level. For students in Kindergarten, the District will consider student performance on the Reading Comprehension or Mathematics Applications/Concepts and Problem Solving subtests of the *Iowa Tests of Basic Skills – Form C* (ITBS). For students in grades one (1) through 3 (three), the District will consider student performance on the Reading Comprehension or Mathematics Applications/Concepts and Problem Solving subtests of the *Stanford Achievement Test-Tenth Edition* (SAT-10) or the *Iowa Tests of Basic Skills – Form C* (ITBS). Spanish-speaking LEP students in K-12 can be administered the *Aprenda II* Spanish language achievement test.

For students in grades four (4) through twelve (12), the District will consider student performance on the Reading or Mathematics subtests of the *Florida Comprehensive Assessment Test 2.0* (FCAT-2.0) based on the grade-level Developmental Scale Score. Additionally, with the implementation of the End of Course (EOC) exams, new Matrix scales have been developed to correlate to the Plan B percentiles for academic achievement.

•To determine the intellectual development of a potentially gifted student, a licensed psychologist will administer an individualized test of intelligence, including, but not limited to the *Wechsler Intelligence Scale for Children-Fourth Edition* (WISC-IV), *Stanford-Binet Intelligence Scale-Fifth Edition* (SB), *Differential Ability Scales-Second Edition* (DAS), *Kaufman Assessment Battery for Children-Second Edition* (KABC), *Reynolds Intellectual Assessment Scale* (RIAS), *Universal Nonverbal Intelligence Test* (UNIT), and the *Wechsler Nonverbal Scale of Ability* (WNV).

•The *Williams Creativity Scale* is used to determine creativity. The *Williams Creativity Scale* is an assessment of creativity completed by the student's teacher. It contains 48-items assessing originality, fluency, flexibility, elaboration, curiosity, imagination, complexity, and risk taking.

Additionally, all students must display a need for a special program and a majority of the characteristics of gifted children as measured by the *Gifted Characteristics Checklist* in order to be determined eligible for gifted programs.

Eligibility Criteria

To meet eligibility under the *District Plan to Increase the Participation of Underrepresented Students in the Gifted Program* (Plan B), a student must obtain a total of nine points in three of the four categories on the matrix scoring system with a minimum score of 112 in the Intelligence Quotient category. Attached are the forms

Justin A. Koren
Research Investigator

Curtin University

Curtin University
School of Science and Mathematics Education Centre

Letter of Inquiry: School Site Principal

My name is Justin A. Koren and I am currently working on my doctoral degree with Curtin University in Perth, Western Australia. I wish to request permission for selected teachers of gifted and non-gifted students in your school to participate in a teacher-based research study. The purpose of the research is to investigate both gifted and non-gifted middle-school students in terms of classroom environment and attitudes within the Miami-Dade County Public School District.

I would like to administer classroom environment and attitudinal surveys during the months of March and April 2012.

Student participants will be asked to be involved in the completion of two surveys. The entire process will take approximately 35 minutes. The contact will be non-intrusive and will not disrupt classroom lessons. The student samples will not be identifiable and confidentiality of all participants will be maintained.

Included in this correspondence are copies of my approval letters from the Miami-Dade County Public School District's Department of Research (Approval Number RCC 1785) and Curtin University's Human Research Ethics Committee (Approval Number SMEC-110-11).

I will be the individual responsible for this research. Should you have any questions, feel free to contact me at (305) 235-1581 or via e-mail at jkoren@dadeschools.net.

Sincerely,

Justin A. Koren
Research Investigator, Curtin University
Teacher, Miami-Dade County Public Schools

Justin A. Koren
Research Investigator

Curtin University

Curtin University
School of Science and Mathematics Education Centre

Participant Information

My name is Justin A. Koren and I am currently completing a piece of research for my degree of Doctor of Philosophy at Curtin University in Perth, Australia.

Purpose of Research
I am investigating both gifted and non-gifted middle school students in terms of classroom environment and attitudes within the Miami-Dade County Public School District.

Your Role
I am interested in comparing data obtained from both gifted and non-gifted students with the purpose of assessing students' classroom environment and attitudes among middle-school students. You will be asked to be complete two surveys that will be administered during one of your normal class periods. This entire process will take approximately 35 minutes.

Consent to Participate
Your involvement in the research is entirely voluntary. You have the right to withdraw at any stage without it affecting your rights or my responsibilities. Once you have signed the consent form, I will assume that you have agreed to participate and allow me to use your data in this research.

Confidentiality
The information you provide will be kept separate from your personal details, and only my supervisor and I will have access to the questionnaires you complete. These questionnaires will be kept in a locked cabinet for five (5) years at which point they will be destroyed.

Further Information
This research has been reviewed and given approval by the Curtin University Human Research Ethics Committee (Approval Number SMEC-110-11). The Miami-Dade County Public School District's Department of Research Services has also reviewed and approved this research (Approval Number RRC 1785). If you would like further information about this study, please feel free to contact me at jkoren@dadeschools.net or (305) 235-1581. Alternatively, you may contact my doctoral supervisor, Professor Barry Fraser, at B.Fraser@curtin.edu.au.

Should participants wish to make a complaint on ethical grounds, please contact the Human Research Ethics Committee Secretary at hrec@curtin.edu.au or via post at Office of Research Development, Curtin University, GPO Box U1987, Perth, Western Australia 6845.

Thank you for your involvement in this research. Your participation is greatly appreciated.

Justin A. Koren
Research Investigator

Curtin University

Curtin University
School of Science and Mathematics Education Centre

Parental Consent Form

Dear Parent/Guardian:

Permission is requested for _____ to participate in a teacher-based research study. The purpose of the research is to investigate both gifted and non-gifted middle school students in terms of classroom environment and attitudes within the Miami-Dade County Public School District. Participants will be asked to be involved in the completion of two surveys. The entire process will take approximately 35 minutes.

The contact will be non-intrusive and will not disrupt classroom lessons. The student samples will not be identifiable and confidentiality will be maintained.

Participation in this study will be beneficial in investigating the classroom environment and attitudes among middle-school students.

Please indicate below whether you will give permission for the above named student to participate in this valuable research study by returning the form to his/her teacher.

I will be the individual responsible for this research. Should you have any questions, feel free to contact me at (305) 235-1581 or via e-mail at jkoren@dadeschools.net.

Sincerely,

Justin A. Koren

___YES, permission is GRANTED to participate.

_____
Parent/Guardian Name (Signature)

_____
Parent/Guardian Name (Print)

_____
Date

___No, permission is DENIED to participate.

_____
Parent/Guardian Name (Signature)

_____
Parent/Guardian Name (Print)

_____
Date

What Is Happening In this Class? Questionnaire

Directions for Students

The survey you are about to take contains statements about practices which could take place in your class. You will be asked how often each practice takes pace. Your teacher will not see your responses, so you should be completely honest.

There are no 'right' or 'wrong' answers. Your honest opinion is what is wanted. Think about how well each statement describes what this class is like for you and then click the answer that you feel is best.

Some statements in this survey will seem similar. Don't worry about this. Simply give your opinion about all statements.

For each statement, click one of the following answer choices:

- o **ALMOST ALWAYS**
- o **OFTEN**
- o **SOMETIMES**
- o **RARELY**
- o **ALMOST NEVER**

Practice Example

Suppose you were given the statement "I choose my partners for group discussions." You would need to decide whether you choose your partners 'Almost Always', 'Often', 'Sometimes', 'Rarely', or 'Almost Never'. If you selected 'Often' as your answer choice, you would click the circle to the left of the word 'Often'.

Questions?

If you have any questions about any part of this survey, please raise your hand and someone will come to your computer station to provide assistance.

Thank you for taking the time to complete this survey!

Student Information

This section provides information about you. Your information will be kept seperate from your responses. Don't worry, your teacher will never see your responses. This entire survey will be kept CONFIDENTIAL.

1. Please enter your name in the boxes below:

FIRST Name:

LAST Name:

2. Please enter your M-DCPS Student ID# in the box below:

3. Please enter your TEACHER'S LAST NAME in the box below (this is the teacher and class you will be considering when answering the survey questions):

4. What subject does the teacher you listed in Question #3 teach?

- Language Arts
- Mathematics
- Science
- Social Studies

5. Please select your school from the list below:

- ◯ Arthur & Polly Mays 6-12 Conservatory of the Arts
- ◯ Campbell Drive Middle School
- ◯ Centennial Middle School
- ◯ Coconut Palm K-8 Academy
- ◯ Cutler Ridge Middle School
- ◯ Gateway Environmental K-8 Learning Center
- ◯ Homestead Middle School
- ◯ Leisure City K-8 Center
- ◯ Redland Middle School
- ◯ Richmond Heights Middle School

6. Select which program you are enrolled in:

- ◯ Gifted
- ◯ Not Gifted

7. Select your current grade level:

- ◯ 6th Grade
- ◯ 7th Grade
- ◯ 8th Grade

8. Select your gender:

- ◯ Male
- ◯ Female

9. Do you currently receive free or reduced lunch?

- ◯ Yes, I receive free or reduced lunch.
- ◯ No, I don't receive free or reduced lunch.

10. How would you describe your ethnicity?

- ◯ White, non-Hispanic
- ◯ Black/African American
- ◯ Hispanic
- ◯ Asian
- ◯ Native American
- ◯ Other

11. Are you currently enrolled in an English Language Learner (ELL) or Limited English Proficiency (LEP) Program such as ESOL?

- ◯ Yes, I am in an ELL/LEP program such as ESOL.
- ◯ No, I am not in an ELL/LEP program such as ESOL.

Student Cohesiveness

12. I make friendships among students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

13. I know other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

14. I am friendly to other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

15. Students in this class are my friends.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

16. I work well with other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

17. I help other students in this class who are having trouble with their work.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

18. Students in this class like me.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

19. In this class, I recieve help from other students.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

Teacher Support

20. The teacher takes a personal interest in me.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

21. The teacher goes out of his/her way to help me.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

22. The teacher considers my feelings.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

23. The teacher helps me when I am having trouble with my work.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

24. The teacher talks with me.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

25. The teacher is interested in my problems.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

26. The teacher walks around the classroom to help me and does not only stay in one area.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

27. The teacher's questions help me to better understand my work.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

Involvement

28. I discuss my ideas in class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

29. I give my opinions during class discussions.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

30. The teacher asks me questions.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

31. My ideas and suggestions are used during classroom discussions.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

32. I ask the teacher questions.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

33. I explain my ideas to other students.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

34. Other students ask me how to solve problems.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

35. The teacher asks me to explain how I solve problems.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

Task Orientation

36. Getting a certain amount of work done in class is important to me.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

37. I do as much as I set out to do in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

38. I know the goals for this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

39. I am ready to start this class on time when the bell rings.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

40. I know what I am trying to accomplish in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

41. I pay attention during this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

42. I try to understand the work in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

43. I know how much work I have to do in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

Cooperation

44. I cooperate with other students when doing assigned class work.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

45. If the teacher allows me, I share my books and materials with other students when doing assignments.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

46. When I work in groups in this class, there is teamwork.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

47. I work with other students on projects in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

48. I learn from other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

49. I work with other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

50. I cooperate with other students on class activities.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

51. Other students work with me to achieve class goals.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

Equity

52. The teacher gives as much attention to my questions as to other students' questions.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

53. I receive the same amount of help from the teacher as do other students.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

54. I have the same amount of say in this class as other students.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

55. I am treated the same as other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

56. I receive the same encouragement from the teacher as do other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

57. I receive the same opportunity to contribute to class discussions as do other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

58. My work receives as much praise and recognition as other students' work in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

59. I get the same opportunity to answer questions as do other students in this class.

- ◯ Almost Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Almost Never

This concludes Part One of the survey. Stay focused! Part Two only has 32 questions.

Students' Adaptive Learning Engagement in School Questionnaire

Directions for Students

The survey you are about to take contains statements about practices which could take place in your class. You will be asked how often each practice takes pace. Your teacher will not see your responses, so you should be completely honest.

There are no 'right' or 'wrong' answers. Your honest opinion is what is wanted. Think about how well each statement describes what this class is like for you and then click the answer that you feel is best.

Some statements in this survey will seem similar. Don't worry about this. Simply give your opinion about all statements.

For each statement, click one of the following answer choices:

- o **STRONGLY AGREE**
- o **AGREE**
- o **NOT SURE**
- o **DISAGREE**
- o **STRONGLY DISAGREE**

Practice Example

Suppose you were given the statement "I think school is fun." You would need to decide whether you 'Strongly Agree', 'Agree', are 'Not Sure', 'Disagree', or 'Strongly Disagree'. If you selected 'Agree' as your answer choice, you would click the circle to the left of the word 'Agree'.

Questions?

If you have any questions about any part of this survey, please raise your hand and someone will come to your computer station to provide assistance.

Thank you for taking the time to complete this survey!

Learning Goal Orientation

In this class...

60. One of my goals is to learn new concepts.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

61. One of my goals is to learn as much as I can.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

62. One of my goals is to master new skills.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

63. It is important that I understand my work.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

64. It is important that I improve my skills.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

65. It is important for me to learn the class content (what is being taught).

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

66. Understanding new ideas is important to me.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

67. It is important that I understand what is being taught to me.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

Task Value

In this class...

68. The lessons I learn can be used in my daily life.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

69. The lessons I learn stimulates (motivates) my thinking.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

70. The lessons I learn satisfy my curiosity.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

71. The lessons I learn are helpful to me.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

72. The lessons I learn are relevant to me (I can relate to them).

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

73. The lessons I learn are of practical (useful) value.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

74. The lessons I learn are interesting.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

75. The lessons I learn are useful for me to know.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

Self-Efficacy

In this class...

76. I can master the skills that are taught.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

77. I can figure out how to do difficult work.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

78. Even if the class work is hard, I can learn the lesson(s).

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

79. I can do even the hardest work if I try.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

80. I will receive a good grade.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

81. I can learn the material.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

82. I can understand the concepts taught.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

83. I am good at this subject.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

Self-Regulation

In this class...

84. Even when tasks are uninteresting, I keep working.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

85. I work hard even if I do not like what I am doing.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

86. I get myself to learn even when there are other, and perhaps better, things to do.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

87. I concentrate so that I won't miss important points in class.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

88. I finish my work and assignments on time.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

89. I don't give up even when the work is difficult.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

90. I concentrate to remember information presented in class.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree

91. I never quit until I finish what I am supposed to do.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Not Sure
- ◯ Disagree
- ◯ Strongly Disagree