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LIMITED ENGLISH PROFICIENT (LEP) STUDENTS AND THEIR TEACHERS
ATTITUDES OF THE LEARNING ENVIRONMENT
IN MATHEMATICS CLASSES

by

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ABSTRACT

This study described the attitudes of students who are limited English proficient (LEP) and their teachers toward the learning environment within their mathematics classes. Data collected via a student survey, student and teacher interviews, and classroom observations were analyzed in this mixed-method study to investigate these attitudes. Accuracy of the findings was confirmed via triangulation. A population of 79 students was chosen through purposive sampling methods that included LEP and non-LEP students in algebra and geometry classes. Students were administered a 30-item questionnaire using the What is Happening in This Class? survey. Scores provided from the survey's six scales were analyzed using an independent samples *t*-test to describe similarities and differences between the students. The Cooperation Scale was found statistically significant ($p = .002$) with a mean score of 3.72 for the LEP students compared to 3.74 for non-LEP students. Four scales were found statistically significant ($p < 0.05$) comparing the algebra and geometry students: Teacher Support ($M = 3.61$), Involvement ($M = 3.38$), Cooperation ($M = 3.65$), and Equity ($M = 4.24$).

Qualitative data was collected via classroom observations and the student and teacher interviews. Classroom observations provided an additional descriptive account of the lived experiences of the participants in this study. Themes observed within LEP and non-LEP classes involved the physical setting, teaching methods, and instructional media used to present lessons. Four additional themes were found in the LEP classes that referred to the experience of teaching LEP students. They are language use, teaching

methods specific to LEP students, classroom management, and teacher and student support. The interviews incorporated a phenomenological approach to examine the attitudes of participating students and teachers toward their classroom environments. The following five similar themes emerged from the examination of sheltered and nonsheltered teacher attitudes: (a) support systems, (b) teaching methods, (c) student mathematical skills, (d) instructional media, and (e) student attitudes toward mathematics. The additional theme of language emerged exclusively for sheltered teachers.

Suggested further study on the attitudes of LEP students and their teachers in mathematics classes are discussed that includes the amount of support provided in LEP classes, LEP teacher practices in support of student educational needs related to language and mathematics. Additional findings were revealed throughout this study to suggest the effective use of instructional media in LEP mathematics classes and whether or not culture plays a role in their attitudes towards mathematics.

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CHAPTER 1: INTRODUCTION

Background

The deficiency in student mathematical skills has posed an ongoing problem across the United States. The basic mathematical skills demonstrated by high school students are rated as low as *fair* or *poor* by more than 60% of American employers (American Diploma Project, 2004). The 2003 assessment of United States students 15 years of age in mathematics literacy and problem solving was lower than the average performance of same-age students within most of the Organization for Economic Cooperation and Development countries (Lemke et al., 2004). The mathematics performance of students 17 years of age within this country has not measurably changed since the 1970s on the National Assessment of Educational Progress assessments with the exception of Black and Hispanic students (Livingston, 2007). Standardized mathematics test scores reported for limited English proficient (LEP) students within the United States are lower than their non-LEP peers (Perie, Grigg, & Dion, 2005).

Meeting the challenge of properly preparing all students within all academic areas for the world of work, including learners for whom English is a second language, can be daunting for the contemporary educational system throughout this country (Kornblum & Kupetz, 1997). Students born outside the United States and entering American schools with a primary language other than English are classified as either English-language learners (ELLs) or limited English proficient (LEP; *Florida Statute*, 2006; Mikow-Porto, Humphries, Egelson, O'Connell, & Teague, 2004). The unique needs of LEP students

will require scrutiny as educational standards and accountability continues to increase at both state and federal levels (MacDonald, 2004). Standards-based legislation, as well as civil-rights cases, mandate that LEP students are to be included in annual assessments for purposes of equal opportunity, accountability, and representation (Abedi, Lord, Hofstetter, & Baker, 2000). The No Child Left Behind (NCLB) Act of 2001 required states to conduct annual assessments of all students within all academic areas.

To meet the requirements of the NCLB Act of 2001, LEP students within the state of Florida are required to participate in the state assessment program known as the Florida Comprehensive Assessment Test (FCAT), which assesses reading, writing, mathematics, and science (U.S. Department of Education, 2005). All high school students must pass the FCAT to receive a standard diploma (Florida Department of Education [FDOE], 2001, 2004). While the percentage of high school LEP students passing the mathematics section of the FCAT is higher than the percentage passing the reading section, the passing scores of this student population are still lagging behind those of non-LEP students (*FCAT Student Performance*, 2006). The mathematics scores of LEP compared to non-LEP students within Florida are not unusual. The LEP students within the United States tend to score lower “. . . than Caucasian students on standardized tests of mathematics achievement at all grade levels, the Scholastic Aptitude Test (SAT), and the quantitative and analytical sections of the Graduate Record Examination (GRE)” (Abedi, Hofstetter, Baker, & Lord, 2001, p. 4).

A major goal of the state of Florida is for LEP students to develop English proficiency allowing them to reach their full academic potential (Multilingual Student

Education Services, 2004). Consequently, LEP high school students are assigned to language-arts classes specifically designated for instruction delivery in English for speakers of other languages (ESOLs) and *sheltered classes* for other subject areas (e.g., mathematics, science, and social studies). While classes designed for ELLs focus on language acquisition and language-arts curriculum for the respective grade level, sheltered classes address content knowledge within other subject areas (Multilingual Student Education Services, 2004; Orange County Public Schools [OCPSs], 2006). Sheltered classes are exclusive to LEP students. The curriculum matches that of nonsheltered classes; however, instruction related to concepts and class materials are adjusted to accommodate language learning. Educators with sheltered classes are subject-area teachers trained to deliver instruction to ELLs. Lessons are delivered in English with modified instruction using strategies designed for ELLs to render content more comprehensible to LEP students while concurrently promoting English language development (Multilingual Student Education Services, 2004; OCPSs, 2006; U.S. District Court for the Southern District of Florida, 1990).

As a group, LEP students struggle in school and lag behind their language-majority peers in academic achievement (Echevarria, 2006; Echevarria, Short, & Powers, 2006). Compared to non-LEP pupils, higher dropout rates are reported for LEP students and significant achievement gaps between these two student populations are also evident with state and national assessments (Snow & Biancarosa, 2003). Closing the gap between LEP and non-LEP students in mathematics is not an easy task; however, it must be accomplished for the future of the LEP student population (Davison, Seok-Seo,

Davenport, Buterbaugh, & Davison, 2004; Ding & Davison, 2004). Career opportunities would be severely limited by a lack in mathematics achievement; such skills are not only necessary throughout daily life, but are increasingly needed throughout the workplace (National Council of Teachers of Mathematics [NCTM], 2000). While there are many reasons for LEP students lagging behind their non-LEP peers academically, one major indicator of student achievement is a positive learning environment.

Theoretical Framework

Learning-environment research investigates the classroom via application of a concept known as *psychosocial environment*, which is composed of psychological and social relationships. These relationships include those existing both among students and between students and teachers (Moos, 1979a; Rawnsley & Fisher, 1998). The concept is rooted in theory developed by Lewin (1936), which dates back to the mid-1930s, as well as the personality theory introduced by Murray during 1938. Lewin recognized that the environment and its interaction with the individual personal characteristics of individuals is a potent determinant of behavior (as cited in Fraser, 1989). He formulated his idea in the form of an equation ($B = f[P,E]$), wherein B represents behavior, f equates to function, P is person, and E represents the respective environment. Lewin noted, “Every scientific psychology must take into account whole situations, i.e., [*sic*] the state of both person and environment” (p. 12). Murray followed the Lewin approach, proposing a needs-press model. This model allows similar representation of person and environment

in common terms with *personal needs* referring to the personal determinants of behavior and *environmental press* representing external determinants of behavior (Murray, 1938).

Research into psychosocial human environments evolved into the specific domain of educational environments (Moos, 1979b). The social ecological framework developed by Moos emphasizes the inclusion of social-environment (e.g., social climate) and physical-environment (e.g., ecological) variables, which must be concurrently considered. Moos posited that the “. . . social-ecological setting in which students’ function can affect their attitudes and moods, their behavior and performance, and their self-concept and general sense of well-being” (p. 3). Social-environmental variables can be categorized into three broad dimensions—(a) relationship, (b) personal growth or goal orientation, and (c) system maintenance and change. The relationship dimension assesses the extent to which students are involved in their environment by supporting peers and expressing themselves freely and openly. The personal growth or goal orientation dimension measures the basic goals of the environment such as the areas within which personal development and self-enhancement tend to manifest. The dimension of system maintenance and change measures the extent to which the environment maintains control, responding to change in an orderly manner with clear expectations.

Moos (1979b) measured the social environments of classrooms to determine the type of learning environment most beneficial to students. Current studies have replicated his research and suggested that the psychosocial climate of classrooms is related to student achievement (Dorman, Adams, & Ferguson, 2002; Fisher & Fraser, 1982; Goh & Fraser, 1996, 1998; Henderson, Fisher, & Fraser, 2000; Rawnsley & Fisher, 1998;

Soerjaningshi, Fraser, & Aldridge, 2001; Trinidad, MacNish, Aldridge, Fraser, & Wood, 2001). Other researchers have demonstrated that associations exist between the perception of classroom environment and student outcomes across nations, subject matter, education levels, languages, and cultures (Dorman, 2003; Dorman, et al., 2002; Fraser, 1994, 2002; Fraser, B., 1998; Fraser, B. J., 1998). In terms of how this relates to mathematics proficiency, it raises concern regarding the type of environment needed to encourage students to gain, process, and evaluate their knowledge (English, 2002). Research has illustrated that classroom environments perceived as positive tend to lead toward increased student achievement (Chang & Fisher, 2001). Relationships among students and between students and teachers are important to the creation of such positive learning environments (Moos, 1979a; Rawnsley & Fisher, 1998). Montecel and Cortez (2002) found that a positive classroom environment for LEP pupils contributes to high academic performance by this student population.

Statement of Purpose

This current mixed-method study was conducted with two purposes. The first was to present a complete and coherent description of learning-environment attitudes exhibited by LEP students and their teachers within mathematics classrooms. The second was to identify those components within mathematics classrooms with the strongest association to a positive learning environment for LEP students. This study measured attitudes found within the mathematics-class environment through student surveys, classroom observations, and student and teacher interviews. Attitudes toward the learning

situation included students and teachers perceptions of the class's limitations and recommendations for a supportive, positive environment. A literature search revealed that, within the area of mathematics, study focused on learning environments is sparse, with research connecting mathematics learning environments for LEP students nonexistent. In an attempt to take a broader approach to learning attitude, this study gleaned information related to the attitudes of LEP students toward their learning environments by collecting learner perceptions in this regard.

Research Questions

This research examined student and teacher attitudes within three sheltered mathematics classrooms and three nonsheltered mathematics classrooms via a mixed-method approach. The following research questions guided the study:

1. Is there a significant difference in attitudes of the classroom between sheltered and non-sheltered mathematics students?
2. Is there a significant difference in the attitudes of the classroom between Algebra and Geometry students?
3. What are the teachers' attitudes of the mathematics classes in sheltered versus non-sheltered environments?
4. What are the students' attitudes of the mathematics classes in sheltered versus non-sheltered environments?

Population and Study Sample

This study was conducted in a Florida public high school within OCPSs. The population sample for this study was composed of high school students ranging in grade level from the 9th through the 12th grades. They attended either sheltered or nonsheltered mathematics classes that taught similar content. Purposive sampling was applied for the selection of student participants because only three sheltered mathematics classes were available at the school—two Algebra I classes and one geometry class. The study sample was composed of 46 students within the nonsheltered group and 33 students within the sheltered group—a total sample size of 79.

Methodology

This study used a mixed research method combining quantitative and qualitative approaches via a survey instrument, classroom observations, and student and teacher interviews. Data from the different sources using the strategy of triangulation were examined to check the accuracy of the findings (Creswell, 2003). First, quantitative data of students' attitudes of the mathematics classroom environment were collected using a survey. Survey scores were analyzed using an independent samples *t*-test to describe any similarities and differences of the classrooms. Second, qualitative data were drawn via classroom observations and student and teacher interviews. When these data-collection procedures were completed, the survey findings were contextualized using the qualitative findings with descriptions consisting of observation notes and verbal participant accounts.

Significance of the Study

This study increases understanding of learning environments as they relate to educational research in the following ways:

1. Addresses the gap in existing literature by measuring the attitudes of high school students within sheltered mathematics classrooms.
2. Introduces the What is Happening in This Class? (WIHIC) instrument within a Florida high school.
3. Facilitates a clearer understanding for educational institutions and teachers of the manner in which attitudes are likely to influence the classroom performance and participation of LEP students.

Many studies have evaluated mathematics achievement in LEP high school students (Abella, Urrutia, & Shneyderman, 2003; Chamot, 1995; Ding & Davison, 2004; Genesee & University, 1999; Lindholm-Leary & Borsato, 2005; Wang & Goldschmidt, 1999).

The attitudes of students, teachers, schools, or parents, as they relate to LEP programs, are also addressed in related literature (Hart & Alleksaht-Snider, 1996; Layzer, 2000; Lindholm-Leary & Borsato, 2005; Torres-Velasquez & Lobo, 2005). Few studies have investigated the classroom environment or climate as it relates to LEP students (Butler & Gutiérrez, 2003; Montecel & Cortez, 2002) and, of these, language acquisition was the focus, rather than attitudes toward the environment of mathematics classrooms serving LEP students.

Mathematics learning environments serving LEP students are important to the current study for two reasons. First, understanding the impact of student attitudes on the mathematics learning environment could help teachers evaluate their classroom environments and current instructional practices. Secondly, such environments could hold general importance for the overall education of the underrepresented population of LEP students. Teachers can use the findings of this research to discover differences between their own perceptions and those of their students, allowing them to make subsequent improvements toward positive learning environments. Understanding student attitudes of the learning environment will give teachers additional information aiding in their understanding of individual differences in student performance and ways of assisting their students through difficulties with mathematics.

Limitations

The current study presented the following limitations:

1. Participation in the study was strictly voluntary.
2. The study was limited to one public high school within the OCPSs system within the state of Florida.
3. Data collection was limited to the willingness and ability of individuals to respond in a timely fashion, if at all, and to respond accurately.
4. Generalizability of the study results is limited due to the specific population and specific context.

Assumptions

The following assumptions were made while investigating the research questions:

1. The student participants responded to the survey questions honestly.
2. The survey instruments are reliable and valid.
3. The study participants were representative of all students and teachers within sheltered mathematics classrooms.

Definition of Terms

The following terms are reflected throughout this research and are defined for purposes of the study:

Attitude refers to opinions or beliefs that include cognitive feelings related to the teaching and learning of mathematics, curriculum, programs, student perceptions of self and the role of teachers, and the social context within which mathematics is taught.

The *classroom learning environment* is composed of psychological and social relationships among students and between students and teachers. This includes student self-perceptions of their abilities and behavior. The classroom learning environment is created for students by the school, teachers, and peers.

English for speakers of other languages (ESOLs) is a broad term referring to educational strategies that use English as the language of instruction for LEP students (Mikow-Porto et al., 2004). The acronym *ESOL* is also used by the participants in this study to refer to learners who are identified as acquiring English as a second language.

The *Florida Comprehensive Achievement Test (FCAT)* is a statewide evaluation tool geared to the Sunshine State Standards (SSSs) that directly assess student achievement of stated benchmarks in reading, writing, and mathematics (FDOE, 2001, 2005, 2006a; U.S. Department of Education, 2005).

Language arts for ELLs refers to a language-arts class that is an alternative to mainstream language-arts classes with instruction in English but geared toward students with native languages other than English (Multilingual Student Education Services, 2003, 2004; U.S. District Court for the Southern District of Florida, 1990).

Limited English proficient (LEP) refers to a student with a native language other than English and whose proficiency in English aural comprehension, speaking, reading, and/or writing is below the average level of other English-speaking students of the same age and academic grade. This group is also referred to as *English language learners (ELL)* (Mikow-Porto et al., 2004).

Nonsheltered mathematics students are native English-speaking students and former LEP students now assessed as English proficient.

Sheltered geometry and Algebra I classes are high school mathematics classes composed exclusively of LEP students. These classes follow the same course objectives as nonsheltered classes (Multilingual Student Education Services, 2004; U.S. District Court for the Southern District of Florida, 1990).

The *sheltered instructional model* focuses on grade-level curricula with lessons delivered in English. A variety of techniques are employed to assist LEP students access core curriculum.

Sheltered mathematics students have been classified as LEP and are taught using the sheltered instructional model.

The *Sunshine State Standards (SSSs)* reflect the Florida curriculum framework that includes curriculum content areas, strands, standards, and benchmarks. The SSSs provide guidelines for the educational curriculum of the state and identify the reading, writing, and mathematical skills ultimately expected of students (FDOE, n.d., 2005, 2006b).

Summary

The mathematical skills of high school students pose a challenge for educators across the globe. Related test scores within the United States have “. . . barely budged since the early 1970s” (U.S. Department of Education, Office of the Secretary, 2006, p. 10). American students classified as LEP have even lower mathematics test scores than non-LEP students. Meeting the educational standards and accountability issues of the NCLB Act for LEP students has also presented a formidable challenge for United States educators (MacDonald, 2004). Within the state of Florida, both LEP and non-LEP students are required to pass the FCAT to graduate with a standard diploma. To assist LEP students in reaching their potential in mathematics, sheltered mathematics classes are offered with teachers trained in instruction delivery to students for whom English is a second language. Yet, the FCAT mathematics scores of LEP students still tend to be lower than those of non-LEP students.

As mentioned earlier, positive learning environments are one of the indicators of academic achievement in LEP students. However, research into this realm for this student population remains minimal. Current and past research into learning environments in general has illustrated an association between the psychosocial characteristics of students and the extent of their academic achievement and viewpoints (Fraser, B. J., 1998). The mathematics learning environment is defined by the attitudes of students and teachers. This study applied a mixed-method research design, combining quantitative and qualitative approaches to investigate this environment. The attitudes of students and teachers were examined to help educators better understand how attitudes are likely to influence performance and participation by LEP students within the classroom. Data were collected using a survey instrument, interviews, and observations of participating students and teachers.

CHAPTER 2: LITERATURE REVIEW

Mathematics Crisis

According to the Business-Higher Education Forum (2005), “The average U.S. student begins on top of the world in mathematics and science in elementary school, slips to near the middle of the pack by grade 8, and has sunk to near the bottom by grade 12” (p. 6). United States students are outperformed by students residing within a number of other nations. The Program for International Student Assessment evaluates students 15 years of age in reading, mathematics, and science literacy every 3 years. During 2003, the performance of United States students in mathematics literacy and problem solving was lower than the average performance reported for students within the majority of countries included in the Organization for Economic Cooperation and Development (Lemke et al., 2004). The Trends in International Mathematics and Science Study is another international assessment of mathematics and science. No measurable change was detected by this measure between 1999 and 2003 in the mathematics performance of United States eighth-grade students 13 to 14 years of age. Data collected between 1995 and 1999 indicated an increase in mathematics performance for American students (Gonzales et al., 2004).

Of all United States students within the 12th grade who completed the 2005 National Assessment of Educational Progress, a low 23% scored at or above proficiency in mathematics. These results are based upon administrative procedures allowing accommodation for limited-English-proficient (LEP) students and students with

disabilities. Prior to 2005, these two student groups were excluded because no testing accommodation had been provided (Grigg, Donahue, & Dion, 2007). While the 12th-grade assessment included LEP students, scores for these students were not separated within the final report; however, this separation was reflected in the report of eighth-grade mathematics performance.

The 2005 mathematics scores for the eighth-grade participants indicated a significant difference of 37 points between LEP and non-LEP students. A low 6% of the mathematics scores for the LEP students indicated at or above proficiency, compared to 30% of the scores for non-LEP students indicating mathematics proficiency (Perie et al., 2005). Achievement differences between LEP and non-LEP students have been documented in past research. Mathematics scores among LEP students on standardized tests tend to be lower than their non-LEP peers (Abedi et al., 2001). According to the Florida Department of Education (FDOE; 2006a), “Opportunities must be in place for students of all backgrounds to be successful in high school so that they graduate, enter the workforce with adequate skills, and/or continue in postsecondary education” (p. 20).

Students with Limited English Proficiency

American education is changing as student populations become increasingly diverse culturally, educationally, and linguistically (Genesee & University, 1999). Students classified as LEP were not born within the United States; hence, their native language is not English and they have difficulty speaking, reading, writing or listening to the English language (*Florida Statute*, 2006). There is no “typical” LEP student. Wide

variability exists in language skill, languages spoken, prior education, and country of origin (Echevarria et al., 2006; Garcia, 2000). Some LEP students are recent immigrants, brought to this country by their families seeking refuge from political repression or persecution or simply improved economic opportunity. Others are members of families who have lived in the United States for generations within ethnolinguistic subgroups. Some LEP students have had prior education while others have had very limited formal schooling (Kornblum & Kupetz, 1997).

The growing number of LEP students within American schools reflects the overall trend of the United States population as it becomes increasingly diverse in its ethnic and linguistic makeup (Echevarria, 2006; Short & Echevarria, 2004). By the 2030s, the English-language learner (ELL), or LEP, demographic group is projected to comprise 40% of the school-age population (Thomas & Collier, 2002). From the 1990-91 to the 2000-01 school years, the LEP population within the United States has grown approximately 105%, compared to 12% growth in the general school population (Kindler, 2002). Dalton, Sable, and Hoffman (2006) found that over 1.3 million LEP students, or approximately 12% of all students, were served within 92 of the largest school districts during the 2003-04 school year. Thirteen of these districts are within the state of Florida. The number of students 5 to 17 years of age, attending U.S. schools and speaking non-English languages within their homes, increased from 9% to 20% between 1979 and 2005. The majority of these students speak Spanish within their homes (Livingston, 2007). The Florida Hispanic population attending public schools represented the greatest numerical gains from 1980 to 2005—an increase of 418% (FDOE, 2007a). As the

population of LEP students throughout the state increases, meeting the instructional needs of these students has become a formidable challenge for educators (FlaRE Center, n.d; Genesee & University, 1999; MacDonald, 2004).

Accountability

The No Child Left Behind (NCLB) Act of 2001 requires that all students reach high standards by demonstrating proficiency in English-language arts and mathematics by 2014 (Abedi & Dietel, 2004). Under Title III of the Act, state educational agencies, local agencies, and schools are accountable for the required increase in language proficiency and core academic-content knowledge for LEP students. The purpose of Title III is to assist school districts in teaching English to LEP students and to help this student population meet the same challenging state standards required of all pupils. High-quality language-instruction programs are to be developed and based upon scientific research. The LEP students are expected to attain high levels of English-language achievement, high levels of achievement in core academic courses, and the same success in state academic content and achievement standards. State annual assessments are required to test all students in all academic subject areas to fulfill the accountability requirements of the Act.

To meet the accountability requirements of the NCLB Act of 2001, LEP students within the state of Florida are required to participate in the state assessment

program—the Florida Comprehensive Assessment Test (FCAT; U.S. Department of Education, 2005). This test is designed to assess reading, writing, mathematics, and science according to state standards. It contains the following two basic components: (a) a criterion-referenced test, which measures selected benchmarks in reading, writing, and mathematics from the state academic-achievement standards known as the Sunshine State Standards (SSSs); and (b) a norm-referenced test, which measures the performance of each student against national norms (FDOE, 2001, 2005).

The FCAT was designed to assess the rigorous content defined by the SSSs that were developed and adopted by the State Board of Education within Florida (FDOE, 2001). The SSSs establish guidelines surrounding knowledge expected of students upon completion of each grade level for the subjects of the arts, foreign language, health, language arts, mathematics, physical education, science, and social studies (FDOE, 2001, 2005). The standards are arranged in a hierarchical manner for each grade with benchmarks specifying measurable outcomes for each standard. The content of the FCAT is based upon specific benchmarks for reading, mathematics, science, and writing that can be assessed in a single test. At the writing of this study documentation, the FDOE was updating the mathematics standards for all students (P.Wright, personal communication, November 20, 2006).

The FCAT must be passed for students to graduate with a standard diploma, beginning with the graduating class of 2002-03. The FCAT is administered in elementary through high school. In high school, there are two separate tests—one for 9th-grade students and the other for those attending the 10th grade. The Grade 10 FCAT is used to

determine if the respective students will graduate with a standard diploma. The students have six opportunities to pass this test as they are completing the 11th and 12th grade levels (FDOE, 2001, 2004; Office of Program Policy Analysis and Government Accountability, 2006). The FCAT uses a developmental scale for scoring and achievement levels to evaluate if a student has met a passing score in relation to his or her grade level. The developmental scales range from 86 to 3,000, across Grades 3 through 10, and are used to measure annual progress. Achievement levels ranging from one to five are subsequently assigned based upon the developmental scores. For purposes of the required accountability of the NCLB Act of 2001, Level 1 is considered *below basic*, Level 2 is *basic*, Levels 3 and 4 are *proficient*, and Level 5 is considered *advanced* (U.S. Department of Education, 2005).

Accommodations for LEP students are provided to assist with their completion of the FCAT. The Florida Department of State, State Library and Archives of Florida (n.d.) explained that the accommodations for these students are to enable them to fully participate in the statewide assessment program, as defined in the Florida statutes and the administrative ruling of the State Board of Education. The accommodations are

1. Additional time to complete each test section.
2. Access to dictionaries transferring vocabulary from English to heritage language and from heritage language to English.
3. Opportunity to be tested in a separate room with LEP students or with a heritage-language teacher serving as the test administrator.
4. Limited assistance by a teacher trained to instruct ELLs or by a

heritage-language teacher.

Historically, much attention has been given to the percentage of LEP students passing the reading section of state assessments. However, the percentage passing the mathematics sections of state assessments has begun to receive attention during the last 5 years by researchers, practitioners, and policy makers (Francis, Rivera, Lesaux, Kieffer, & Rivera, 2006). The reading level needed for the mathematics test items is “. . . approximately one grade level below the grade level of the test, except for specifically assessed mathematical terms or concepts” (FDOE, 2007b, p. 2). Overall, the percentage of LEP students attending Grades 3 through 10 who have completed the FCAT at a proficient level (i.e., Level 3 and above) has increased. During the 2005-06 school year, the percentage increased to 33%, which was up from 30% during the 2004-05 year and 20% during the 2000-01 school year. The percentage of students attending Grades 3 through 10 and scoring at Level 1 (i.e., below basic) steadily declined from 60% during 2001 to 41% during 2006 (FDOE, 2006b). However, a low 46% of the LEP students of the 2005-06 school year passed the mathematics sections of the Grade 10 FCAT, compared to 77% of all students throughout the state (*FCAT Student Performance*, 2006). It is the aim of the state of Florida for 100% of the students attending Grades 3 through 12 to exhibit proficiency in mathematics by the 2013-14 school year (FDOE, 2005; U.S. Department of Education, 2005).

Limited English Proficiency and Mathematics

Many program models have been developed to assist LEP students in mastering the language and subject content. Districts void of the resources to promote bilingualism will typically adopt one or more program model(s) toward that end. Examples of such models include a traditional bilingual education model, a newcomer program, sheltered instruction, or classes designed for ELLs. As mandated by law, LEP students attending public schools are required to participate in instructional programs designed to promote English-language proficiency and mastery of academic content (Mikow-Porto et al., 2004).

State and County Education Programs

Florida schools focus on meeting the needs of LEP students as a result of recent changes to Florida statutes and the FDOE State Board of Education administrative rules. *Florida Statute Title 48, Chapter 1003* (2006) addressed instruction, funding, and access to programs for LEP students. The State Board of Education subsequently adopted rules for implementing the law (Florida Department of State, State Library and Archives of Florida, n.d.). The primary framework for the provision of services to LEP students is the 1990 League of United Latin American Citizens, also referred to as META (i.e., Multicultural Education Training and Advocacy) and the Florida Consent Decree. This decree addresses the civil rights of LEP students with regard to equal access to all educational programs. It provides a structure for the delivery of instruction comprehensible to this student population, but no specific methodology or program

delivery. Florida districts are to provide a LEP plan with proposed procedures and methodologies for serving LEP students (U.S. District Court for the Southern District of Florida, 1990).

The FDOE 2004-05 Orange County District LEP plan addresses the unique linguistic and instructional challenges of LEP students to ensure comprehensible instruction delivery. The district aims to develop English mastery in LEP students while also assisting them to achieve their full academic potential in all other academic subject areas. All schools are expected to follow the policies, plans, and procedures of this LEP instructional program (Multilingual Student Education Services, 2004). The long-term objectives of the Multilingual Student Education Services of Orange County for LEP students are

1. Students will be provided with grade-appropriate instruction in all content areas following state standards and district benchmarks.
2. Students will be provided with language arts instruction in the native language at all K-8 bilingual centers.
3. Students will be provided with ESOL/Language Arts instruction daily to develop the National ESL Standards through the following: listening, speaking, reading, writing, culture, and self-concept. (p. II-1, 2)

According to the Multilingual Student Education Services (2004), all schools are expected to deliver instruction in English, using strategies designed for ELLs and/or any one of a combination of instructional approaches through one of the following six program-delivery models, as feasible for the school:

1. Home School (Basic Program/ESOL K-12)
2. Home School Sheltered Instruction/ESOL (K-12)
3. Sheltered Instruction/ESOL Center (K-8)

4. Home School One Way Developmental Bilingual Education/ESOL (K-8)
5. One Way Developmental Bilingual Education Programs (K-8)
6. Two Way Developmental Bilingual Education Programs (K-8) (p. V-26)

Two of the six program-delivery models are used for LEP high school students within Orange County Public Schools [OCPSs]. The home-school model is used when the home school of the respective student has an insufficient number of LEP students to provide sheltered instruction. The home-school sheltered-instruction model is implemented when the home school does have a sufficient number of LEP students (Multilingual Student Education Services, 2004).

Sheltered Instruction and Placement

Krashen (1985) introduced the first model for sheltered instruction within the United States. A sheltered class can stand alone as a program when bilingual education is not feasible, or it can be considered a facet of a transitional bilingual program that bridges the bilingual classroom with mainstream classrooms (OCPSs, 2006). The objectives of the Orange County district for LEP students in sheltered classes are to:

1. Promote attainment of grade level Florida Sunshine State Standards (SSS)
2. Facilitate LEP acquisition of English language proficiency (via ESOL)
3. Ensure LEP acquisition of academic language necessary to succeed in content area classrooms (p. 89)

Sheltered classrooms are often composed of LEP students with diverse language, family, and cultural backgrounds (Genesee & University, 1999; LaCelle-Peterson & Rivera, 1994; Short & Echevarria, 2004). The students simultaneously develop

English-language proficiency and skill within a subject area other than language arts. Language-arts instruction is delivered by an educator trained to teach English for speakers of other languages (ESOLs), as is the instruction within other subject areas (i.e., mathematics, science, social studies, and computer literacy; OCPSs, 2006). Sheltered instruction has many components similar to that of language-arts instruction designed for ELLs; the primary difference is the content taught (see Figure 1). Subject-area teachers trained in educating ELLs use a variety of teaching strategies to render the content comprehensible to LEP students (Echevarria et al., 2006; Multilingual Student Education Services, 2004, OCPSs, 2006; Short, 1991). Instruction is delivered in English at the level of proficiency demonstrated by each student (Echevarria, 2006; Genesee & University, 1999; Multilingual Student Education Services, 2004; OCPSs, 2006). According to the OCPSs, because sheltered instruction “. . . lacks the academic advantages of developing literacy in the language the students think in, native language must be provided, when feasible, as required by the Florida Consent Decree for LEP” (p. 92). Classes of 15 or more LEP students of one language group are required to have available a paraprofessional or teacher proficient in their language and trained to assist in sheltered instruction (Multilingual Student Education Services, 2004; OCPSs, 2006; U.S. District Court for the Southern District of Florida, 1990).

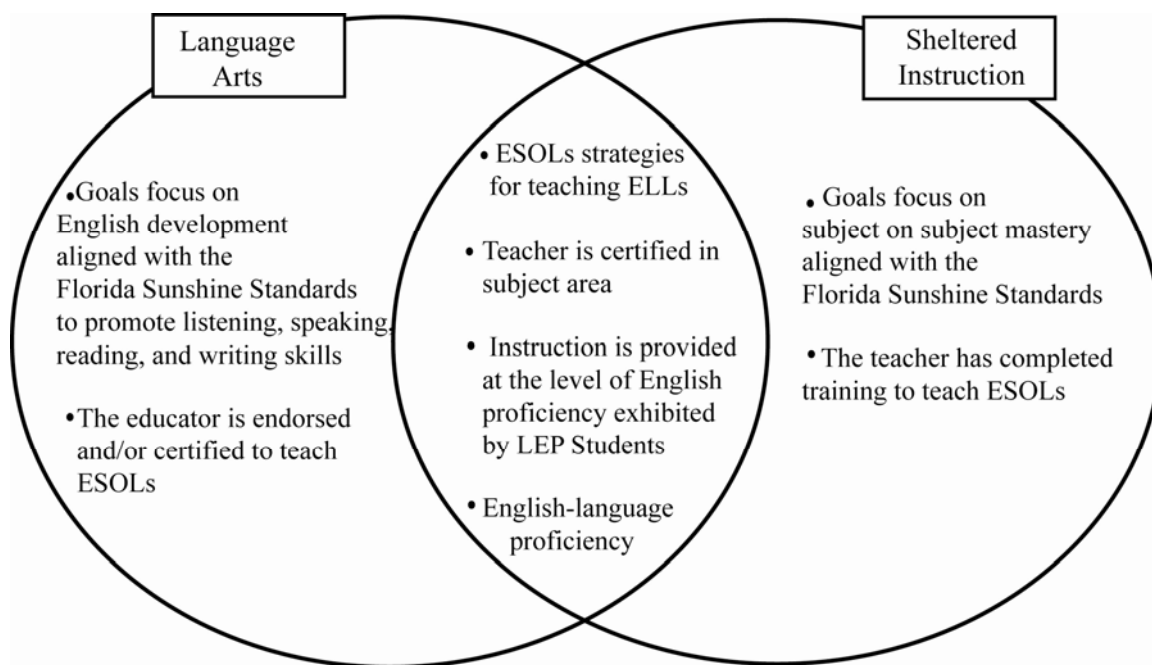


Figure 1: Sheltered instruction and comparison with language arts instruction for ELLs. ESOLs = English speakers of other languages; LEP = limited English proficient.

High school students that qualify as ELLs are automatically placed within sheltered classes in OCPSS. The Home Language Survey, which all parents complete upon registering their children, determines student qualification for the program by posing the following three questions (Multilingual Student Education Services, 2004):

1. Is a language other than English used in the home?
2. Did the students have a first language other than English?
3. Does the student most frequently speak a language other than English?
(p. IV-1)

Students are placed within a mainstream program when only Question 1 on the Home Language Survey is answered affirmatively. An aural/oral English-proficiency test or the Language Assessment Battery (LAB) is also administered to determine whether

placement in a program designed for ELLs is appropriate. When either Questions 2 or 3 of the survey is answered affirmatively, the respective students are placed within a program designed for ELLs and the LAB test is administered. Thus, an affirmative answer to any of the survey questions spurs administration of the LAB. High school students scoring below the 51st percentile on the LAB qualify for placement within English classes for ELLs and placement in sheltered classes teaching other subject areas depends on their past academic process and language proficiency. Students scoring at or above the 51st percentile on the LAB also complete a district-approved standardized reading-and-writing proficiency test (i.e. Metropolitan Achievement Test) in English to verify their qualifications. Those passing both tests are placed within mainstream English and subject-area classes. If the LAB or standardized district-approved reading-and-writing proficiency test is failed, the respective student remains in an English class for ELLs. Placement recommendations for those students not passing either proficiency tests are referred to the LEP Committee “ . . . depending on individual student cases and educational data provided to the LEP Committee” (Multilingual Student Education Services, 2004, p. V-23).

Students who are ELLs transferring from another Florida school district are qualified to continue services within an OCPS (Multilingual Student Education Services, 2004). Those qualifying for the ELL program are placed within the appropriate sheltered class for mathematics (i.e., sheltered algebra or geometry). Placement is based upon prior school transcripts and the respective requirements for graduation. Prior mathematical

skills are not tested for purposes of placement (Curriculum Compliance Teacher, personal communication, August 4, 2007).

Teachers and Instruction

Florida teachers instructing LEP students in subject areas other than English-language arts (e.g., mathematics, science, social studies) must be qualified to deliver such instruction and appropriately certified (OCPSs, 2006). According to the United States District Court for the Southern District of Florida (1990), teachers throughout the state must complete 60 in-service points for training in educational strategies designed for ELLs or earn equivalent college credit in (a) methods of teaching the home language, (b) home-language curriculum and materials development, and (c) testing and evaluation in the home language. Since 2006, paraprofessionals must be certified to assist teachers with sheltered classes of 15 or more students in schools receiving Title I funds (NCLB Act of 2001). OCPSs (n.d.) have created the following two options for both Title I and non-Title I schools in terms of adherence to the new certification requirement:

1. Two years of postsecondary study at an institute of higher education (i.e., a minimum of 60 semester hours) or award of an associate's degree.
2. Completion of a formal state or local assessment measuring the ability to assist in the instruction of math, reading, and writing; or math readiness, reading readiness, or writing readiness.

Required paraprofessional training and experience within Orange County by non-Title I and noncertified personnel is a high school diploma or GED. Paraprofessionals must demonstrate written and oral linguistic skills in English and a minimum of one target language (e.g., Spanish, French, and Creole; Orange County School District, 1998).

Teachers in sheltered classes are trained to implement methodologies designed for instruction delivery to ELLs and are sensitive to the language demands of the course syllabus (Short, 1991). These educators modify the core curriculum to meet the language-development needs of ELLs (Genesee & University, 1999).

Sheltered-instruction lessons are organized around activities integrating the skills of the language process (i.e., listening, speaking, reading, and writing). Teachers consider the linguistic and cultural experiences of LEP students (Celedón-Pattichis, 2004; Kornblum & Kupetz, 1997; OCPSs, 2006). Similar to nonsheltered classes, high expectations for all students are communicated with common goals (OCPSs, 2006). During instruction, students and teachers are continuously modulating and negotiating the English level incorporated (Genesee & University, 1999). According to the OCPSs, “Teachers scaffold instruction to aid student comprehension of content topics and objectives by adjusting their speech and instructional tasks, as well as by providing appropriate background information and experiences” (p. 127). To deliver clear and meaningful lessons, teachers integrate techniques such as graphic organizers, cooperative learning, visuals, supplemental material, and slower speech (Echevarria, 2006; Genesee & University, 1999).

The sheltered instruction observation protocol (SIOP) model developed by Echevarria, Vogt, and Short (2000) is recommended for use by the FDOE office of Multicultural Student Language Education (OCPSs, 2006). It is a lesson planning-and-delivery approach composed of 30 instructional strategies reflecting best practices for use with LEP students. The instructional strategies of Echevarria and colleagues are grouped into eight components essential for content that is comprehensible to this student population—preparation, building background, comprehensible input, strategies, interaction, practice/application, lesson delivery, and review/assessment. The strategies provide teachers of sheltered classes an effective approach for the delivery of content to LEP students, rendering the concepts comprehensible while concurrently promoting English-language development.

Because the SIOP includes effective methods for instruction delivery to ELLs that have been developed since 1985, the model is not considered groundbreaking; however, it offers a framework for organizing instruction with strategic features that promotes academic success for LEP students (Echevarria et al., 2000; Short & Echevarria, 2004). The following strategies introduced by Short and Echevarria were found to help teachers promote academic literacy among ELLs within all subject areas using the SIOP model:

1. To identify the language demands of the content course
2. Plan language objectives for all lessons and make them explicit to students
3. Emphasize academic vocabulary development; activate and strengthen background knowledge
4. Promote oral interaction and extended [*sic*] academic talk

5. Review vocabulary and content concepts
6. Give students feedback on language use in class (pp. 11–12)

These strategies provide a system for teachers to promote academic literacy within all subject areas.

Implementing strategies designed for effective instruction delivery to ELLs is not sufficient alone, in terms of ensuring the academic success of LEP students. Short and Echevarria (2004) reported, “Without systematic language development [*sic*], many students never gain the academic literacy skills needed to succeed in mainstream classes, to meet content standards and to pass standard-ized [*sic*] assessment” (pp. 10–11). The SIOP is a tool that not only assists teachers in implementing strategies for effective lesson planning, but it also provides school administrators with an understandable and specific method for observing and providing feedback to teachers (OCPSs, 2006). The Orange County school district expects all educators to implement the SSSs for their respective content area (Multilingual Student Education Services, 2004; OCPSs, 2006). Teachers of LEP students in OCPSs are required to implement sound research practices within the classroom, as mandated by the Florida Consent Decree of 1990 to comply with the requirements set forth by Title III of the NCLB Act of 2001 (as cited in Multilingual Student Education Services, 2004).

The purpose of implementing sheltered instructional strategies is to render content comprehensible to LEP students (Echevarria et al., 2006; Multilingual Student Education Services, 2004; OCPSs, 2006; Short, 1991). The SIOP model provides strategies for teaching language and subject content simultaneously (Echevarria et al., 2000; Short &

Echevarria, 2004). Teachers exposed to, and trained in, the model have greater success with regard to student achievement than those who have not been introduced to the framework. Echevarria and colleagues (2006) found that LEP students with teachers trained to implement the SIOP model performed significantly better on academic writing assessments than LEP students with teachers who had no contact with the model. Appropriate use of effective instructional practices for LEP students should close the initial achievement gap between LEP and non-LEP students in approximately 5 to 6 years (Thomas & Collier, 1997).

The SIOP model emphasizes the importance of teaching subject content (e.g., mathematics) while concurrently teaching language (Echevarria et al., 2000; Short & Echevarria, 2004). Language acquisition can affect student ability to successfully complete standardized tests and mathematical word problems. High school LEP students within Orange County must successfully pass the FCAT to receive a standard diploma (FDOE, 2001, 2004). They must also demonstrate the ability to read at approximately a ninth-grade level in the FCAT, with the exception of mathematical terms or concepts separately assessed (FDOE, 2007b). Research focused on the understanding and solving of mathematical word problems by ELLs found that these students were more successful when the word problems were presented in the first language of the students (Bernardo, 2002; Bernardo & Calleja, 2005).

Additional research found that it takes ELLs between 5 and 9 years to achieve grade-level performance in the second language (Cummins, 2000; Thomas & Collier,

1997). Cummins posited that a difference exists between academic and conversational language acquisition. He stated,

The conversational/academic distinction addresses a variety of policy, instructional, and assessment issues related to ELL/bilingual [or LEP] students. For example, it helps account for the longer time periods typically required for ELL students to catch up academically in English as compared to acquiring fluent conversational skills in English. It also draws attention to the potential for discriminatory assessment of bilingual students when their L2 [second language] conversational fluency is taken as an index of academic L2 acquisition. (p. 84)

Learning Environment

According to English (2002), research into learning environments for mathematics raises the following considerations: “What kinds of environments are needed to promote the democratic access, that is to encourage students to develop, test, extend, or refine their own increasingly powerful understandings?” (p. 10). Learning mathematics in a new environment, and with a new language, presents additional challenges for LEP students and their teachers. In addition to being held to high standards, and regularly and systematically assessed, LEP students must be offered a customized learning environment with a qualified teacher and opportunities for student-directed learning (Mikow-Porto et al., 2004). An enriched program must meet the academic, cognitive, emotional, social, and physical developmental needs of students within a natural learning environment (Thomas & Collier, 2002). Furthermore, cultural background influences the needs of students (LaCelle-Peterson & Rivera, 1994). As explained by Charbonneau and John-Steiner (1998), “The socialization process for Hispanic children, as well as native Americans, is one of cooperation and sharing rather

than competition with the focus on individual [*sic*] achievement commonly seen in the majority culture” (p. 92).

The learning environment for LEP, sheltered mathematics students is more than the physical setting such as the color of the walls, the number of posters, or the quality of desks and resources (National Council of Teachers of Mathematics [NCTM], 2000; Rawnsley & Fisher, 1998). Sheltered instruction that supports optimal learning occurs when the classroom environment is nonthreatening, active, and challenging. Students must feel safe and free to take risks during the learning process, which encourages self-confidence and competent classroom participation (OCPSs, 2006). Within the classroom, students must have equitable access to technology, curriculum, supplies, materials, and equipment to facilitate learning. Classrooms should be equipped with visual aids and realia that promote and enhance second-language acquisition and grade-level knowledge acquisition. Student desks can be arranged to encourage cooperation and promote interaction, which are important for the development of language and cultural adjustment in LEP students (OCPSs, 2006; Short, 1991).

Teachers are responsible for creating and nurturing an intellectual environment by the decisions made, physical setting, and classroom discussions orchestrated. Creating a challenging and supportive environment is required for the effective implementation of best practices in the instruction of mathematics (NCTM, 2000). The learning environment needed for LEP students to learn mathematics is positive, cooperative, and supportive of active learning (OCPSs, 2006; Thomas & Collier, 1997). Difficulties can be prevented by matching the instructional needs to the classroom environment (Francis et

al., 2006). A positive classroom environment that communicates high expectations for students is one indicator of high academic performance. A successful curriculum values the culture of students and adheres to high standards. Instruction should be challenging, technologically appropriate, and reflective of best practices (Montecel & Cortez, 2002). Student interaction with teachers is frequent (Montecel & Cortez, 2002; Thomas & Collier, 1997). The NCTM (2000) considers the ideal environment as one involving all interested parties communicating subtle messages surrounding the value of learning and applying mathematics. The Council stated,

All interested parties must work together to create mathematics classrooms where students of varied backgrounds and abilities work with expert teachers, learning important mathematical ideas with understanding, in environments that are equitable, challenging, supportive, and technologically equipped for the twenty-first century. (p. 3)

Summary

International and United States assessments of mathematics performance reflect the ongoing problem of deficient mathematical skills in American students. Standardized mathematics test scores reported for LEP students within the United States are lower than their non-LEP peers. Students classified as LEP present varied educational and cultural experiences. As this student population increases, meeting the unique needs of these students, as well as federal and state accountability issues, present formidable challenges for educators. LEP high school students also face the challenge of the FCAT to receive a standard diploma. While much attention has been paid in the past to the reading section

of state assessments, the mathematics segment has now gained importance with the assessment of LEP students.

To assist LEP students attending high school with mathematics achievement, Florida incorporates the SIOP model. Sheltered instruction is used in high schools to teach subject content other than language arts. The model is composed of a variety of teaching strategies to render content comprehensible to LEP students. Teachers in sheltered classes are required by the FDOE to apply practice from scientific research, follow the SSSs, and implement the SIOP model in lesson planning and instruction delivery. Sheltered classes must provide a positive, cooperative, and supportive environment wherein frequent interaction occurs between students and teachers. Success for LEP students requires teachers to provide challenging, safe, and technologically appropriate instruction while valuing the cultural backgrounds of students.

CHAPTER 3: METHODOLOGY

Research Design

This study applied a mixed-method approach combining quantitative and qualitative procedures via a survey instrument, classroom observations, and student and teacher interviews. A mixed-method approach, or triangulation, allows for additional avenues toward data verification and interpretation (McKnight, Magid, Murphy, & McKnight, 2000). Tobin and Fraser (1998) recommended combining methods via quantitative questionnaires and qualitative methods such as observations and interviews. The collection of triangulated data is a critical aspect of strong educational research (McKnight et al., 2000). The purpose of mixing these methods in the current study was to obtain a substantive understanding of the classroom environment (Fraser & Tobin, 1991; Tobin & Fraser, 1998). This approach has a dual advantage of characterizing classrooms from the perspectives of the study participants and hence capturing data otherwise easily missed or considered unimportant (Fraser, 1989). The method also attempts to facilitate an in-depth understanding of the phenomenon under study (Denzin & Lincoln, 2005).

The quantitative data collected with the What is Happening in This Class? (WIHIC) instrument (Aldridge & Fraser, 2000) provided a basis for data drawn from the qualitative methods (i.e., teacher interviews and classroom observations). The qualitative data facilitated an in-depth understanding of the classroom environment experienced by limited-English-proficient (LEP) students attending sheltered mathematics classes. When these data-collection procedures were completed, the findings were contextualized using

the qualitative findings with descriptions consisting of observation notes and verbal participant accounts (Fraser & Tobin, 1991). The student and teacher perceptions of the classroom environment are defined with use of the mixed-method approach (Fraser, 1989). According to Stake (2005), “The qualitative researcher is interested in diversity of perception, even the multiple realities within which people live” (p. 454). Diverse perceptions were collected through six student and six teacher interviews and six classroom-observation sessions. Purposive sampling was applied in the selection of student and teacher participants. Three sheltered and three nonsheltered mathematics classes were observed.

This mixed-method study had two purposes. The first was to present a complete and coherent description of learning-environment attitudes exhibited by LEP students and their teachers within mathematics classrooms. The second was to identify those components within mathematics classrooms with the strongest association to a positive learning environment for LEP students. Before beginning this study, approval was requested from the Institutional Review Board of the University of Central Florida (see Appendix A), the Orange County Public Schools [OCPSs], and the school principal of the study site. Upon receipt of these approvals, data collection began via a survey instrument, student and teacher interviews, and classroom observations. The research questions that guided the study were formulated in the following manner:

1. Is there a significant difference in attitudes of the classroom between sheltered and non-sheltered mathematics students?

2. Is there a significant difference in the attitudes of the classroom between Algebra and Geometry students?
3. What are the teachers' attitudes of the mathematics classes in sheltered versus non-sheltered environments?
4. What are the students' attitudes of the mathematics classes in sheltered versus non-sheltered environments?

Setting, Target Population, and Study Sample

This study was conducted in a Central Florida public high school within OCPSs. The Orange County school district was ranked 13 out of the 100 largest public school districts across the nation during the 2003-04 school year (Dalton et al., 2006). The district was the fourth largest within Florida for public-school membership during 2006 (Florida Department of Education [FDOE]: Education Information and Accountability Services, 2007). Approximately 175,434 students were enrolled within kindergarten through the 12th grade during the 2006-07 school year (OCPSs, 2007). Compared to other Florida school districts, OCPSs serve one of the highest percentages of LEP students at 15.7% compared to 8.2% for the state (FDOE: Education Information and Accountability Services, 2006). The top 10 native countries for these students begin with the United States at 52.9%, followed by Puerto Rico at 18.4% (OCPSs, 2007; see Table 1). The LEP student population of the district originate from 180 different countries and speak 133 languages with Spanish being 74.2% the dominant native language. From 1980 to 2005, the Hispanic population had the greatest numerical gains within Florida public schools

from 120,662 students during 1980 to 624,899 during 2005. This represents a gain of 504,237 students or 418% (FDOE, 2007a).

Table 1: Top 10 Native Countries of Limited-English-Proficient Students within Orange County, Florida during 2006-07

Country of origin	Number of limited-English-proficient students	Percentage
United States	20,225	52.9
Puerto Rico	7,028	18.4
Haiti	2,149	5.6
Mexico	1,610	4.2
Columbia	1,349	3.5
Venezuela	777	2.0
Cuba	608	1.6
Dominican Republic	521	1.4
Brazil	514	1.3
Peru	304	0.8
Others	3,120	8.2
Total	38,205	100.0

The population sample for this study was composed of high school students ranging in grade level from the 9th through the 12th grades. They attended either sheltered or nonsheltered mathematics classes that taught similar content. Purposive sampling was applied for the selection of student participants because only three sheltered mathematics classes were available at the school—two Algebra I classes and one geometry class. According to Creswell (2003), purposely selected participants facilitate clearer understanding of the research problem and related questions. Selection of the nonsheltered students (NSs) was based upon their classes matching that of the participating sheltered students (SSs; i.e., within two Algebra I classes and one geometry class). There were 51 students attending the sheltered classes of the study site. These students originated from a diverse sampling of countries before their transfer to the high school. This study group also included students that first attended other United States schools before transferring to the study site. Thirteen countries of birth were represented in the sample of SSs. Puerto Rico, the United States, the Dominican Republic, Ecuador, and Venezuela were the top five countries. The majority of the sample of SSs were born in Puerto Rico (24), followed by the United States with only five students (OCPSs, 2007; see Table 2).

The sample size and power calculations were performed using the PASS 2005 statistical software. The study sample was composed of 46 students within the nonsheltered group and 33 students within the sheltered group—a total sample size of 79.

Table 2: Country of Origin for Sheltered Students of the Study Site

Country	Algebra I classes	Geometry class	Sheltered classes
Puerto Rico	10	14	24
United States	3	2	5
Dominican Republic	1	3	4
Ecuador	3	1	4
Venezuela	3	1	4
Columbia	3	0	3
Cuba	0	1	1
Brazil	1	0	1
Mexico	1	0	1
Peru	0	1	1
Republic of the Philippines	1	0	1
Russia	0	1	1
Ukraine	1	0	1
Total	27	24	51

A sample of this size achieves 80% power to detect an effect size of 0.67, which is a medium to large effect size, with estimated group standard deviations of 0.67 and 0.67 and a significance level (i.e., alpha) of 0.05 using a two-tailed independent-samples *t* test. For example, if the average student-cohesiveness score for the nonsheltered study group was 3.0, and the population average for the sheltered group was 3.45, this would correspond to an effect size of 0.67. This study would have had an 80% chance of detecting this difference at the 0.05 level of significance.

Recruitment of student participants first required permission from the sheltered teachers (STs) and nonsheltered teachers (NTs) of the study site. Contact was made with the mathematics Chair during January 2007 to explain the study and arrange a date to meet with all mathematics teachers during their monthly department meeting. During this meeting, the study was explained, questions were answered, and volunteers from the nonsheltered and sheltered algebra and geometry classes were requested. Two teachers volunteered from the nonsheltered Algebra I class, and one teacher volunteered from the geometry class. All three of the STs—two for Algebra I and one from the geometry class—also volunteered to participate in the study. The following week, the Adult Informed Consent forms were distributed to these sheltered and nonsheltered mathematics teachers. Once the forms were returned, the teachers were requested to establish a day for the researcher to visit their classrooms, speak to the students about the study, and distribute the parental consent forms to be taken home. These forms were written in both English and Spanish to accommodate those parents who do not read English (see Appendix B). A paraprofessional was also present within the sheltered

classrooms to assist with translation, as needed. All classrooms were visited twice over a period of 2 weeks to discuss the study and collect completed forms returned via the students.

Instrumentation

The WIHIC instrument was slightly modified for this study from the second version refined by Aldridge and Fraser (2000) to gather data for the quantitative analyses. Fraser, Fisher, and McRobbie (1996) originally designed, field tested, and validated the first version, which contained nine scales with 10 items within each scale. The WIHIC utilized the best features of a range of past learning-environment questionnaires (Aldridge & Fraser, 2000; Aldridge, Fraser, & Huang, 1999; Fraser, 2002). Aldridge and Fraser further refined the instrument when they conducted a study with a sample of 1,081 Australian students and 1,879 Taiwan students attending junior-high science classes. The WIHIC was translated from English to Mandarin and back to English to ensure the Mandarin version maintained the intended meaning of the concepts within the original English version. Comparisons between the Mandarin translations and original English versions of the questionnaires revealed changes toward more succinct or simpler wording than used within the original English version, which led to the final form of the WIHIC. This final instrument contained 56 items organized within the following seven separate scales with eight items within each scale (see Appendix C): the Student Cohesiveness Scale, Teacher Support Scale, Involvement Scale, Investigation Scale, Task Orientation Scale, Cooperation Scale, and the Equity Scale.

The Moos (1979a, 1979b) conceptual scheme for human environments is used for classification of the WIHIC scales (see Table 3; Dorman, Adams, & Ferguson, 2003; Raaflaub & Fraser, 2002). The scheme characterizes environments under the following three basic dimensions: (a) relationship, (b) personal development, and (c) system change. Additionally, the WIHIC instrument has two forms—class and personal. The personal form is better suited for investigation of the classroom environment such as perceptions of within-class groupings (e.g., gender groups), or for the construction of case studies of individuals. Students are asked in the personal form for their perceptions of their own roles within their classes, rather than their perceptions of their classes as a whole (Fraser, McRobbie, & Fisher, 1996; McRobbie, Fisher, & Wong, 1998; Raaflaub & Fraser, 2002). The personal form of the WIHIC instrument (Aldridge & Fraser, 2000) was used in this study, rather than the class form. Permission to use the instrument was granted by Aldridge and Fraser (see Appendix C).

Reliability and Validity

In a study conducted within Australia and Taiwan, Aldridge and Fraser (2000) found the WIHIC to successfully measure the information it gathers cross-nationally. The instrument demonstrated satisfactory factorial validity and internal-consistency reliability. Each scale was capable of differentiating between the perceptions of students attending different classrooms. Aldridge and Fraser conducted the principal-components factor analysis followed by varimax rotation, which resulted in the acceptance of the revised English and Mandarin versions of the WIHIC. A Cronbach's alpha coefficient

Table 3: Description of the What is Happening in This Class? Scales

Scale	Scale description	Sample item	Moos scheme
Student Cohesiveness	The extent to which students know, help, and are supportive of one another.	I know other students in this class.	R
Teacher Support	The extent to which the teacher helps, befriends, trusts, and is interested in students.	The teacher takes a personal interest in me.	R
Involvement	The extent to which students are attentive, participate in class discussion, perform additional work, and enjoy the class.	I explain my ideas to other students.	R
Investigation	The extent to which there is emphasis on the skills and their use in problem solving.	I carry out investigations to test my ideas.	P
Task Orientation	The extent to which it is important to complete activities planned and remain focused on the subject matter.	I pay attention in this class.	P
Cooperation	The extent to which students cooperate rather than compete with one another on learning tasks.	I cooperate with other students in this class while doing assignment work.	P
Equity	The extent to which students are treated equally by the teacher.	I am treated the same as other students in this class.	S

Note. R = relationship, P= personal development, S = system maintenance and system change.

was also calculated using the class mean as a unit of analysis. Internal-consistency reliability of each of the seven 8-item scales ranged from 0.87 to 0.97 within Australia and from 0.90 to 0.96 within Taiwan for two units of analysis (i.e., individual and class means).

Raaflaub and Fraser (2002) conducted a study of mathematics and science classrooms within Canada, reporting that the alpha coefficients of different WIHIC scales ranged from 0.76 to 0.92 using the students as the unit of analysis, and from 0.78 to 0.95 for class means. With a study sample of 3,980 mathematics high school students from Australia, Britain, and Canada, Dorman (2003) found that all items of the WIHIC scale loaded strongly on their a priori scale. As a confirmatory factor analysis studying the structural attributes of the WIHIC, his findings strongly supported the international applicability of the WIHIC as a valid measure of student self-reported classroom environment.

The WIHIC has been successfully administered within various countries and classes teaching various subject areas translated from English into the respective language of Brunei, Canada, India, Indonesia, and Korea (den Brok, Fisher, Richards, & Bull, 2006; Kim, Fisher, & Fraser, 2000; Koul & Fisher, 2005; Raaflaub & Fraser, 2002; Rickards, Bull, & Fisher, 2001; Treagust & Treagust, 2004). The instrument has also been used successfully in research within the following countries in the cross-national manner indicated: Australia and Taiwan; Australia, Canada, and Britain; Australia and Canada; and Canada, Britain, and the United States (Aldridge & Fraser, 2000; Aldridge et

al., 1999; Dorman, 2003; Dorman, et al., 2002; Dorman et al., 2003; Dorman & Ferguson, 2004).

Student Survey Instrument

The WIHIC was slightly modified for this study to ensure that the participating LEP students would be able to complete the survey within class time. After speaking with the STs, it was determined that the students would not be able to complete the 50 questions within the allotted time, even with the assistance of the paraprofessional. Consequently, the Investigation Scale was deleted and two questions from each of the other scales were eliminated that were similar to other queries within the scale, creating a final 30-item instrument that was meaningful to the experience of SSs. The final version of the WIHIC retained the 5-point Likert-type scale for responses (see Appendix C). To assist students who do not read English, the WIHIC was translated into Spanish (see Appendix C). The Spanish form was also used by the paraprofessional to assist students who did not read Spanish or English, as well as to accurately translate items. The purpose of WIHIC administration in this study was to determine student attitudes surrounding the environment of mathematics classrooms. Scoring the instrument involved averaging all responses (Zandvliet & Buker, 2003) to the 5-point Likert-type scale (1 = *almost never*, 2 = *seldom*, 3 = *sometimes*, 4 = *often*, 5 = *very often*). None of the items are reverse scored (J. Aldridge, personal communication, September 29, 2006; Zandvliet & Buker, 2003). The higher the scores, the more positive the student attitudes are towards the classroom environment.

Interviews and Observation

The interviews in this study were conducted with a phenomenological approach that examined student and teacher attitudes surrounding the classroom environment. Phenomenology is a philosophy, as well as a descriptive research method, that aims to describe the meaning and identify the essential uniqueness of the lived experience within a specific phenomenon (McPhail, 1995; Moustakas, 1994). Phenomenology emerged during the early 20th century in response to the positivistic paradigm that was used to study phenomena at that time. Husserl, who was considered the father of phenomenology, argued that the positivistic paradigm was not appropriate for such study because it could not describe the essential phenomena of the human world (as cited in McPhail, 1995).

Phenomenological research begins with three central assumptions. The first is that the “. . . ‘lived-experience,’ as constituted in consciousness . . . is the unit of analysis for uncovering the structures of the experience” (McPhail, 1995, p. 162). The lived experience, according to McPhail, has various constituents of consciousness such as the cognitive and affective dimensions. A second assumption is that phenomenologists are interested in individuals as meaning makers, and meaningful action, rather than behavior, is the focus of such study. In an attempt to penetrate the meanings sought, phenomenologists examine experience within the routine world of the participants, as opposed to constructing a laboratory environment. Finally, it is assumed that researcher

interest is focused on all relationship structures that may emerge in individual consciousness that shape the meaning of the experience under study.

In this current study, participating students and teachers within both sheltered and nonsheltered mathematics classes were interviewed to compare their experiences and better understand the sheltered learning environment. Phenomenology offers an approach to inquiry that facilitates clearer understanding of unique individuals and the meanings they apply during interaction with others and the environment. The study interviews assisted in examining student and teacher attitudes surrounding the learning environment in nonquantifiable terms and ways. Phenomenological research does not seek to predict or determine causal relationships, but rather, to uncover qualitative factors in behavior and experience. The interviews were an informal, interactive process incorporating open-ended comments and questions, which provided the opportunity to pursue subtopics and direction initiated by the interviewees. The interview questions aimed to evoke a comprehensive account of both student and teacher experiences (Moustakas, 1994). Student questions sought to determine participant attitudes with regard to sheltered and nonsheltered mathematics classes (see Appendix D). Teacher questions sought to determine the rationale behind various actions within the classroom and explore which presented a positive influence within the classroom environment created by the respective teacher (see Appendix D).

Classroom observation (see Appendix E) was used in the data-collection process of this research, along with the study interviews and results from the WIHIC student survey. Observation data included detail surrounding the physical setting, the teaching

techniques applied within the classroom, and evident support provided students and teachers. Some were observed within both sheltered and nonsheltered classes. Others were exclusive to sheltered classrooms. The observations provided a descriptive account of the lived experiences of the participants. The purpose of classroom observations was to monitor the environments of both sheltered and nonsheltered mathematics classes and describe the experiences and any notable differences.

Data Collection

The WIHIC instrument was administered after the students completed the Florida Comprehensive Assessment Test (FCAT) during March 2007. Prior to administration, the Assent Form was distributed to those students who had returned a signed Parental Informed Consent form. The researcher read and explained the Assent Form to the class. Students attending sheltered classes received the form in both English and Spanish (see Appendix B). A paraprofessional proficient in Spanish assisted in the explanation of the Assent Form with students exhibiting difficulty in reading Spanish. Following student completion of the Assent Form, the researcher explained the WIHIC instrument. The students were instructed to circle the responses that best fit their attitudes of the classroom environment under assessment. Those attending sheltered classes received the WIHIC in Spanish, and a paraprofessional proficient in Spanish was present to translate and answer any questions, as needed. The WIHIC consumed approximately 15 minutes for students of the nonsheltered classes and 25 minutes for those within sheltered classes. Student participants who completed the WIHIC were given a token gift of a highlighter

pen. Those who did not participate completed an alternative mathematics assignment determined by the mathematics teacher. Students who participated in the survey were not penalized via their mathematics grade for not completing the assignment.

Classroom observation of the three sheltered and three nonsheltered mathematics classes began after student completion of the WIHIC instrument. Observation sessions were conducted over a 2-week period. Teachers were notified via e-mail to set a date for the sessions and the observation was conducted throughout the entire class time on those days with field notes taken to describe the classroom environments. During data collection, the researcher acted solely as an observer, participating in no class activities. No teacher nor student names appear within the field notes, and the observation sessions were identified solely by class. The study interviews began upon completion of the classroom observations. Interview dates were established with the teachers who were interviewed prior to their students. All study interviews were conducted over a 3-week period. Teacher participants were from each of the three sheltered and three nonsheltered classes. Their interviews were held on the school campus during noninstructional time. Prior to each session, the purpose of the study and conditions of confidentiality were explained. The teachers were also advised that they could stop the interview at any time. The interviews were audio recorded with the tapes supported by field notes. Each session consumed between 20 and 40 minutes. The teachers voluntarily answered all interview questions (see Appendix D).

The teachers approved dates and times for the student interviews. One student from each of the sheltered and nonsheltered classes was randomly selected from those

who returned Parental Informed Consent forms. Interviews were tape recorded with supporting field notes documented. The six student interviews were conducted in a private room or school office during student instructional time. They consumed approximately 20 minutes with the NSs and 40 minutes for those within sheltered classrooms. Participating teachers agreed that the student interviewees would not be penalized via their mathematics grade for not attending during the class time needed for the interview.

Prior to the interview sessions, the purpose of the study and conditions of confidentiality were explained and all of the participating students were advised they could stop the interview at any time. All interviewees signed an Assent Form prior to the onset of each interview. The form was read and explained to the students, and the three students attending the sheltered classes received the form in both English and Spanish. A paraprofessional or teacher proficient in Spanish was present to assist in translating during the interviews with SSs, as needed. The students voluntarily answered all interview questions (see Appendix D). Interpretation of the responses from the teacher and student interviews was verified both during and after the sessions. The verification following each interview clarified main ideas and statements made by each participant to avoid misinterpretation.

Data Analysis

Quantitative

Student responses to the WIHIC instrument were analyzed to differentiate between the attitudes of students attending sheltered versus nonsheltered mathematics classes (i.e., algebra and geometry). All statistical analyses were performed using the SPSS for Windows statistical software. Research Questions 1 and 2 were tested via an independent-sample *t* test. Cohen (1988) reported small, medium, and large effect sizes for an independent-sample *t* test ($d = 0.2$, $d = 0.5$, $d = 0.8$, respectively). The WIHIC scales served as the dependent variables in this study with a 1 through 5 theoretical range of possible values. Assuming normal distribution, 99.7% of the data lie within plus-or-minus 3 standard deviations of the mean. Therefore, the standard deviation can be estimated by the range divided by 6 ($4/6 = 0.67$). Classroom type is an independent variable and was measured on a categorical scale with the two categories of sheltered and nonsheltered. Classroom subject is another independent variable and was also measured on a categorical scale with the two categories of algebra and geometry.

The WIHIC scales serving as the dependent variables in this study are Student Cohesiveness, Teacher Support, Involvement, Task Orientation, Cooperation, and Equity. Student cohesiveness was measured on a continuous scale with a theoretical range from 1 to 5. The score was calculated by computing the average of responses to Questions 1 through 5 on the WIHIC instrument. Lower scores indicated a perception of less student cohesiveness within the classroom environment while higher scores indicated a perception of a greater amount of student cohesiveness within the classroom. Teacher

support was measured on a continuous scale with a theoretical range from 1 to 5. The score was calculated by computing the average of responses to Questions 6 through 10 on the WIHIC instrument. Lower scores indicated a perception of less teacher support within the classroom environment while higher scores indicated a perception of a greater amount of teacher support within the classroom.

Involvement was measured on a continuous scale with a theoretical range from 1 to 5. The score was calculated by computing the average of responses to Questions 11 through 15 on the WIHIC instrument. Lower scores indicated a perception of less involvement within the classroom environment while higher scores indicated a perception of a greater amount of involvement within the classroom. Task orientation was measured on a continuous scale with a theoretical range from 1 to 5. The score was calculated by computing the average of responses to Questions 16 through 20 on the WIHIC instrument. Lower scores indicated a perception of less task orientation within the classroom environment while higher scores indicated a perception of a greater amount of task orientation within the classroom.

Cooperation was measured on a continuous scale with a theoretical range from 1 to 5. The score was calculated by computing the average of responses to Questions 21 through 25 on the WIHIC instrument. Lower scores indicated a perception of less cooperation within the classroom environment while higher scores indicated a perception of a greater amount of cooperation within the classroom. Equity was measured on a continuous scale with a theoretical range from 1 to 5. The score was calculated by computing the average of responses to Questions 25 through 30 on the WIHIC

instrument. Lower scores indicated a perception of less equity within the classroom environment while higher scores indicated a perception of a greater amount of equity within the classroom. The average score for each of the WIHIC scales represents student perceptions of the environment, with higher scores indicating positive perceptions. Analysis of an independent-sample *t* test revealed similarities and differences between the classrooms.

Qualitative

Qualitative data was analyzed using a phenomenological approach to understand lived experiences and develop patterns and relationships of meaning (Moustakas, 1994). A descriptive analysis, based upon student and teacher interviews and classroom observations, was used to answer Research Questions 3 and 4. For effective analysis of the interview data, all sessions were recorded and transcribed verbatim. Information recorded during the observation sessions was grouped into clusters and used to describe any differences between the attitudes of teachers and students within sheltered versus nonsheltered classes. The transcribed interview data were then analyzed using a modified version of the Stevick-Colaizzi-Keen analysis method for phenomenological data (as cited in Moustaka, 1994). The application of this method involved fully describing the interviewer experience with the LEP students using a phenomenological approach. The interview transcripts were subsequently examined to complete the following sequential steps:

1. Consider each statement with respect to its significance for the description of the overall experience.
2. Examine the transcripts for all relevant statements concerning the experiences of SSs and NSs and teachers.
3. List nonrepetitive and nonoverlapping statements and group them into meaning units of the teacher and student experiences between the sheltered and nonsheltered classes.
4. Cluster meaning units into themes between the SS and NS experiences.
5. Synthesize the meaning units and themes into textual descriptions describing the experience including verbatim examples.
6. Reflect upon the textural descriptions to construct an overall description of the structures of participant experiences.
7. Examine the textural descriptions and different perspectives. Explore possible meanings to more fully detail the ST and NT and student experiences.
8. Derive an overall description of the meaning and essences between the ST, NT, and student experiences.

Final descriptions from the study interviews were derived from a comparison of the findings. Teacher and student interview descriptions were used to construct the overall description of the experience. The exact wording of the teacher and student responses was used from the interview transcripts; however, specific references were removed that could potentially compromise participant anonymity. Furthermore, individual transcripts were not published, and participants were referred to as SSs for sheltered students, NSs

for nonsheltered students, STs for sheltered teachers, and NTs for nonsheltered teachers to protect their identity.

To analyze the data collected from the study observations, themes of the experience between the sheltered versus nonsheltered classes were sought and categorized. Some themes were observed within both sheltered and nonsheltered classes; others were exclusive to sheltered classrooms. Observation provides an additional descriptive account of the lived experiences. In this study, they assisted in building a coherent justification for themes collected from the interviews, as well as clarifying key elements of data collected from the WIHIC. Descriptions of interview experiences with the LEP student participants were constructed with a phenomenological approach. The provision of past experience involves background data of the connections between the interviewer and the participants and research site (Creswell, 2003).

Summary

This study applied a mixed-method approach, or triangulation, to assess attitudes between STs and NSs and between algebra and geometry students and teachers. All participants were from one high school within the OCPs in Orange County, Florida. Quantitative data were collected via the WIHIC instrument, which evaluated student attitudes with regard to the classroom environment. Qualitative data were collected from six student and six teacher interviews and classroom observations. The analyses of the teacher and student interviews were distilled into a set of nonrepetitive and nonoverlapping statements, which were subsequently used to construct a complete

description surrounding student and teacher attitudes toward the classroom environment.

A phenomenological approach was applied to analyze the qualitative data toward ultimately describing the lived experience of the sheltered classroom environment.

Findings from the WIHIC survey were then triangulated with the qualitative findings to verify and interpret the data.

CHAPTER 4: FINDINGS

Overview

Using descriptive information from the collection of quantitative and qualitative data, as well as combining qualitative and quantitative research methods, allowed a substantive understanding of the classroom environments under study in this current research (Fraser & Tobin, 1991; Tobin & Fraser, 1998). Data collected via student surveys, student and teacher interviews, and classroom observations were used in this mixed-method investigation of the attitudes of limited-English-proficient (LEP) students toward learning environments. Triangulation confirmed the accuracy of the various findings (Creswell, 2003). The following research questions guided the study:

1. Is there a significant difference in attitudes of the classroom between sheltered and non-sheltered mathematics students?
2. Is there a significant difference in the attitudes of the classroom between Algebra and Geometry students?
3. What are the teachers' attitudes of the mathematics classes in sheltered versus non-sheltered environments?
4. What are the students' attitudes of the mathematics classes in sheltered versus non-sheltered environments?

Quantitative Data Analysis

Using the SPSS statistical program, internal-consistency reliability was conducted on the 30-item What is Happening in This Class? (WIHIC) instrument using the entire study sample. Estimates of the internal consistency of the six classroom-environment scales were calculated using Cronbach's coefficient alpha. Table 4 illustrates that the internal-consistency reliability of the scale scores ranged from 0.51 for student cohesiveness to 0.91 for equity. All of the scores were above 0.78 with good reliability, with the exception of the cohesiveness score. These results indicate that five of the six scales reflected sound internal consistency and were judged as fairly reliable for the sheltered students (SSs) and nonsheltered students (NSs) who completed the WIHIC survey.

Table 4: Cronbach's Alpha Results for Scales of the What is Happening in This Class? Instrument

Scale	Number of items	Cronbach's alpha
Student Cohesiveness	5	0.512
Teacher Support	5	0.894
Involvement	5	0.787
Task Orientation	5	0.849
Cooperation	5	0.827
Equity	5	0.905

The WIHIC was administered to determine whether classroom environment has any significant influence between SSs and NSs attending algebra and geometry mathematics classes. Responses to this survey describe how the participating students perceive their roles within the classroom based upon the following seven scales: Student Cohesiveness, Teacher Support, Involvement, Task Orientation, Cooperation, and Equity. The WIHIC scales served as the dependent variables in this study and presented a 5-point Likert-type scale for responses (1 = *almost never*, 2 = *seldom*, 3 = *sometimes*, 4 = *often*, 5 = *very often*). The item mean for the WIHIC scales ranged from 3.12 to 3.99 for the Involvement Scale and Student Cohesiveness Scale, respectively. The standard deviation ranged from 0.52 to 1.054 for the Student Cohesiveness Scale and Teacher Support Scale, respectively (see Table 5).

Research Question 1

The attitudes of students attending the participating sheltered and nonsheltered mathematics classes toward their learning environments were assessed by the WIHIC student survey. Average scores for each of the scales within the WIHIC represented student perceptions of the environment, with higher scores indicating a positive perception. The WIHIC scales served as dependant variables in this study. The sheltered and nonsheltered classroom types were the independent variables. Results from independent-sample *t* tests were analyzed to describe similarities and differences between the classrooms to address Research Question 1. Student participants were attending

Table 5: Descriptive Statistics for the What is Happening in This Class?

Scale	<i>N</i>		<i>M</i>	<i>SD</i>	Minimum	Maximum
Student Cohesiveness	79	0	3.99	0.52	2.80	5.00
Teacher Support	79	0	3.25	1.054	1.00	4.80
Involvement	79	0	3.11	0.92	1.20	5.00
Task Orientation	79	0	3.89	0.82	1.40	5.00
Cooperation	79	0	3.34	0.93	1.20	5.00
Equity	79	0	3.87	1.04	1.00	5.00

Grades 9 through 11 and were drawn from six mathematics classes—three sheltered and three nonsheltered (i.e., two Algebra I classes and one geometry class). The study sample totaled 79 student participants with 33 sheltered and 46 nonsheltered. The SS participants represented 41.8% of all SSs enrolled at the study site, and the NSs represented 58.2% of the total for this classroom type. The 33 SSs originate from various countries with Puerto Rico represented with the highest number of participants (17), followed by the Dominican Republic (4) and Ecuador (4; see Table 6).

Table 6: Country of Origin for Participating Sheltered Students

Country	Number of limited-English-proficient students	Percentage
Puerto Rico	17	52
Dominican Republic	4	12
Ecuador	4	12
Columbia	2	6
Venezuela	2	6
Brazil	1	3
Cuba	1	3
Republic of the Philippines	1	3
United States	1	3
Total	33	100.0

Research Question 1 asked, “Is there a significant difference in attitudes of the classroom between sheltered and non-sheltered mathematics students?” A two-sample *t* test was used to compare each mean of the WIHIC scales with type of classroom (i.e., sheltered vs. nonsheltered) as the unit of analysis. The results indicated that the following five out of six scales were not significantly significant: Student Cohesiveness, Teacher Support, Involvement, Task Orientation, and Equity. Solely the Cooperation Scale presented a statistically significant difference between the two types of classrooms ($t[77] = -3.21, p = .002$; see Table 7). The mean score from the Cooperation Scale was 3.07

($SD = 0.84$) versus 3.72 ($SD = 0.92$) for the nonsheltered and sheltered groups, respectively. The sheltered group therefore presented a higher average score on the Cooperation Scale than the nonsheltered group. Consequently, SSs perceived more cooperation within the classroom environment than NSs.

Table 7: T-Test Results and Group Statistics for the Learning-Environment Scales Between Classroom Types

WIHIC Scale	Classroom type	<i>N</i>	<i>M</i>	<i>SD</i>	Standard error mean	<i>t</i>	<i>p</i> value
Student Cohesiveness	Nonsheltered	46	3.91	0.498	.073	-1.68	.098
	Sheltered	33	4.11	0.53	.093		
Teacher Support	Nonsheltered	46	3.35	0.95	0.14	.99	0.324
	Sheltered	33	3.11	1.19	0.21		
Involvement	Nonsheltered	46	3.16	0.84	0.12	.54	0.591
	Sheltered	33	3.042	1.033	0.18		
Task Orientation	Nonsheltered	46	3.77	0.72	0.11	-1.60	0.114
	Sheltered	33	4.0606	0.92	0.16		
Cooperation	Nonsheltered	46	3.074	0.84	0.12	-3.21	.002**
	Sheltered	33	3.72	0.92	0.16		
Equity	Nonsheltered	46	4.0043	0.99	0.15	1.33	0.188
	Sheltered	33	3.69	1.091	0.19		

Note. $df = 77$. WIHIC = What is Happening in This Class?

** $p < 0.01$, two-tailed.

Research Question 2

A comparison between algebra and geometry student attitudes toward the learning environment within their mathematics classes was facilitated by administration of the WIHIC survey. The six scales of the instrument served as dependant variables. The classroom subject areas (i.e., algebra and geometry) were the independent variables. An independent-sample t test was applied to address Research Question 2 in terms of describing any similarities and differences between the classroom subject areas. Students attending the 9th through 11th grades within the three sheltered and three nonsheltered mathematics classes (i.e., the two Algebra I classes and one geometry class) totaled 79. The study groups were not equal between Algebra I ($n = 45$) and geometry ($n = 34$) students. The algebra students were at the 9th- and 10th-grade levels within the sheltered classes and the 9th-grade level within the nonsheltered classes. Geometry students attending the sheltered classes were at the 10th- and 11th-grade levels and those within the nonsheltered classes were at the 10th-grade level. Algebra students represented 57% of the total sample and 43% were geometry students.

Research Question 2 asked, “Is there a significant difference in the attitudes of the classroom between Algebra and Geometry students?” The findings indicate that the following two out of six scales were not significantly significant: Student Cohesiveness and Task Orientation. A statistically significant difference was evident between the algebra and geometry subject-area study groups with the following four scales: Teacher Support ($t[77] = - 2.73, p = .008$), Involvement ($t[77] = - 2.36, p = .021$), Cooperation ($t[77] = - 2.70, p = .009$), and Equity ($t[77] = - 2.85, p = .006$; see Table 8). The mean

score on the Teacher Support Scale relating to the algebra classes was 2.98 ($SD = 0.99$), versus 3.61 ($SD = 1.05$) for the geometry classes. The mean Involvement Scale scores were 2.90 ($SD = 0.79$) and 3.38 ($SD = 1.02$) for the algebra and geometry classes, respectively. Mean scores on the Cooperation Scale were 3.11 ($SD = 1.04$) for the algebra classes and 3.65 ($SD = 0.65$) for the geometry class. The average Equity Scale score was

Table 8: T-Test Results and Group Statistics for the Learning-Environment Scales Between Classroom Subjects (N = 79)

WIHIC Scale	Classroom subject	N	M	SD	Standard error mean	t	p value
Student Cohesiveness	Algebra	45	3.92	0.48	.0697	- 1.399	0.166
	Geometry	34	4.088	0.57	.098		
Teacher Support	Algebra	45	2.98	0.99	0.15	- 2.73	.008**
	Geometry	34	3.605	1.049	0.18		
Involvement	Algebra	45	2.902	0.79	0.12	- 2.36	.021*
	Geometry	34	3.38	1.025	0.18		
Task Orientation	Algebra	45	3.74	0.87	0.13	- 1.86	.067
	Geometry	34	4.082	0.703	0.12		
Cooperation	Algebra	45	3.11	1.035	0.15	- 2.70	.009**
	Geometry	34	3.65	0.65	0.11		
Equity	Algebra	45	3.595	1.093	0.16	- 2.85	.006**
	Geometry	34	4.24	0.85	0.15		

Note. $df = 77$. WIHIC = What is Happening in This Class?

* $p < 0.05$, two-tailed.

** $p < 0.01$, two-tailed.

3.60 ($SD = 1.09$) versus 4.24 ($SD = 0.85$) for the algebra and geometry classes, respectively. In summary, the geometry study group presented higher average scores on the Teacher Support, Involvement, Cooperation, and Equity Scales than did the algebra participants (see Table 8). The geometry students perceived a greater amount of teacher support, involvement, cooperation, and equity with their classroom environment than did the algebra students.

Qualitative Data Analysis

Procedure

The second phase of this mixed-methods study sought to provide a deeper understanding of responses to the WIHIC instrument from sheltered and nonsheltered mathematics students. Six student interviews, six teacher interviews, and classroom observations were conducted involving three sheltered and three nonsheltered mathematics classes. The interview data were examined and repeated themes categorized. The classroom observation sessions provided an additional descriptive account of the lived experiences of the participants. Data collected from the interviews and observations facilitated clarification of key elements of data collected via the WIHIC survey.

Triangulation of data confirmed the accuracy of the findings (Creswell, 2003).

Six teacher participants volunteered to participate in this study, one teacher from each of the three sheltered and three nonsheltered algebra and geometry classes (i.e., two Algebra I classes and one geometry class). All of the participating teachers are certified by the Florida Department of Education (FDOE) to teach mathematics within Grades 6

through 12 and Grades 5 through 9. Two of the six teachers were first-year teachers and a third had previously taught a different subject area with the year of this study being his first year teaching mathematics. The remaining three teachers had taught mathematics from 3 to 9 years. None of the sheltered mathematics teachers had prior experience teaching a sheltered mathematics course. All of the sheltered mathematics teachers had completed the necessary in-service training (i.e., 60 points) in strategies designed for English-language learner (ELL) instruction or had obtained equivalent college credit.

One student from each of the three sheltered and three nonsheltered classes (i.e., two Algebra I classes and one geometry class) were randomly selected. Four of these students are female and two are male. Of these, the Algebra I participants were composed of three females and one male; the geometry students were composed of one female and one male. The algebra participants were in the 9th and 10th grades, and those within the geometry class were in the 10th and 11th grades. All of the SSs had resided within the United States for 2 or more years. Table 9 illustrates the participants within the sheltered and nonsheltered classes for Algebra I and geometry classes.

Table 9: Classroom Types, Subjects, and Participants

Classroom Types	Subjects	Teachers	Students
Sheltered	<ul style="list-style-type: none"> • 2 Algebra I • 1 Geometry 	<ul style="list-style-type: none"> • All 3 teachers certified in mathematics • All sheltered teachers completed the necessary ESOL in-service training or college equivalent 	<ul style="list-style-type: none"> • 16 Algebra I • 17 Geometry
Nonsheltered	<ul style="list-style-type: none"> • 2 Algebra I • 1 Geometry 	<ul style="list-style-type: none"> • All 3 teachers certified in mathematics 	<ul style="list-style-type: none"> • 29 Algebra I • 17 Geometry

Role of the Researcher

Applying a phenomenological approach, the investigator described experiences with and about LEP students. This provides background data of connections between the researcher, the participants, and the research site (Creswell, 2003). Reflecting upon past experiences, personal themes emerged with regard to feelings the researcher held involving LEP students and their attitudes toward learning. These experiences and personal perceptions were fully described and involved sympathy toward second-language learners, the role of a high school teacher, and the challenges of mathematics students.

The first personal theme found within the reflections of the researcher was sympathy for ELLs due to the difficulty involved in acquiring a second language while concurrently attempting to learn the content of various subject areas. The first teaching experience of the researcher was a high school classroom with more than 30 students,

50% of whom could not speak English. During 1990, the rules for training educators to teach ELLs had just gone into effect within Florida, and the researcher had no formal training on how to teach these LEP students. Her teaching experiences up to that time were limited to students learning a second language. Consequently, the investigator was sympathetic to the obstacles faced by LEP students. She did have personal experience with her own obstacles while acquiring a second language, which assisted in her communication with her LEP students. To compensate for the language barrier, the researcher used simpler words, slowed her speech, used visual images, and found students within each class that spoke enough broken English to communicate the subject matter to other students.

The second personal theme that emerged for the investigator in this study involved positive experiences teaching LEP students with techniques specifically designed for concurrent language acquisition. After teaching technology in drafting classes for several years, the researcher was able to incorporate effective teaching practices for her ELLs. She created computer videos to acclimate students to geometric terminology, and she used drafting computer software to facilitate their application of mathematics. Because the videos contained her voice, pictures, and text, the students were able to grasp lessons much easier. These videos became valuable tools for the LEP students within her classrooms. They not only helped these students complete assignments, but also provided the means to learn the language of the content area. They liked being able to view the videos privately and replay them. After a few months in the class, the investigator of this study noticed that her LEP students began to build

confidence in their use of English during the lessons. It became apparent that the multiple elements (i.e., voice, picture, and text) contained in the videos met student needs and allowed them to maintain self-respect while acquiring the language of the subject matter.

The last personal theme that emerged for the researcher in this study was her own struggle as a mathematics learner. She had always been taught that the more a desired skill was practiced, the greater proficiency would be developed in the skill. Practicing a school subject via completing homework indeed helped the researcher acquire the respective knowledge, and she did reap academic success at an early age. It was not until high school that difficulty began within her first algebra class during the ninth grade. Unable to understand a mathematical principle led to frustration and a sense of hopelessness. Believing she simply had no aptitude for mathematics, the investigator barely passed the class during the first half of the school year. Following a family move to another city and change of schools, her new algebra class used the same textbook, but was a chapter ahead of the previous class. Her teacher paired her with another student to help her catch up with the class. The peer tutoring proved to be a dramatic help and served as a lesson to the researcher that rote practice is insufficient to overcome some learning obstacles.

The personal themes that emerged for the researcher in this study were influenced by personal and professional experiences within a variety of environments and situations. Her teaching background, personal struggles with mathematics in high school, and understanding the obstacles of acquiring a second language provided a number of valuable perspectives. Reflecting upon and describing prior experiences helped the

researcher to relate to and understand different levels of the experience of the LEP students participating in this study.

Classroom Observation

Classroom observation of the three sheltered and three nonsheltered mathematics classes began upon completion of the WIHIC survey administration. Observation data were examined and categorized into themes with application of the following five steps:

1. Document field notes during classroom observation sessions.
2. Speak with teachers for 5 to 10 minutes following observation sessions to clarify any confusion concerning student material (i.e., study guides and/or handouts).
3. Rewrite observation field notes.
4. Provide teachers with a copy of the observation field notes.
5. Review observation notes a second time for commonalities revealing themes.

Classroom observation provided an additional descriptive account of the lived experiences of the student participants in this study. Themes observed within both sheltered and nonsheltered classes involved the physical setting, teaching methods, and instructional media used to present lessons. Some were observed within both sheltered and nonsheltered classes; others varied between the sheltered and nonsheltered classrooms. Descriptions of similarities and differences built coherent justification for themes collected from the interviews. They also served to clarify key elements of data collected from the WIHIC survey.

Sheltered and nonsheltered classrooms physical settings were similar. Student desks were placed in rows facing the whiteboard and the teachers all had computers at their disposal for instruction. All classrooms had whiteboards and projector screens. Overhead projectors were present in all but one sheltered class.

With regard to teaching methods, both teachers and students exhibited an established routine. All students began preparing for the known routine of their respective teacher upon their arrival to each classroom. An example of such routine would be the teacher checking homework during the first 5 minutes of class, demonstrating the lesson within the next few minutes, and on through class functions addressed in the same order on a daily basis. The teacher incorporated question-and-answer techniques while demonstrating how to solve problems. All of the instructors prompted the students for answers to mathematical problems while progressing through the steps of each problem. They would demonstrate at least three examples of solving a problem from the homework and introduce a new mathematical concept or review for a test as part of their daily routines. The teachers of both sheltered and nonsheltered classes used at least one visual representation during demonstrations (e.g., drawing shapes, diagrams, or tables on the class whiteboard that pertain to the lesson) and consistently emphasized the importance of completing homework and/or practicing lessons outside the classroom. Teachers in two nonsheltered classrooms announced when they were available for additional mathematics assistance. Geometry teachers exemplified 3-D objects to introduce new mathematical concepts and provided multiple examples of how to solve any one mathematical problem.

Teachers of both the sheltered and nonsheltered classes in this study varied in their use of instructional media to present lessons. All of the sheltered teachers (STs) and nonsheltered teachers (NTs) used the whiteboard to demonstrate lessons. Only one ST and two NTs used an overhead projector for instruction. All sheltered and non-sheltered teachers had a computer for personal productivity as well as instructional purposes. Only one teacher, who taught a sheltered class, used the computer for instructional purposes. This ST used a computer projection of a student study guide that contained mathematical vocabulary terms, visual examples (i.e. graphics), and mathematical problems to complete. Students would write answers to mathematical terms and problems in their copy of the study guide. The study guide was created by the ST and incorporated items from the textbook chapters. One other sheltered class used a student mathematics handout, but this handout was generated by the textbook makers and did not provide a vocabulary section. Table 10 provides a summary of the three themes found during the sheltered and nonsheltered classroom observations.

Four additional themes were found in the sheltered mathematics classes during study observations that referred to the experience of teaching LEP students. They are language use, teaching methods specific to LEP students, classroom management, and teacher and student support. The SSs spoke in Spanish among themselves during sheltered class time; however, they asked their teacher questions using English. Teachers managed the students' language deficiencies by having the students sit closely to each

Table 10: Sheltered and Nonsheltered Classroom Observation Themes

Themes	Sheltered & Nonsheltered Classroom Observations
Physical settings	<ul style="list-style-type: none"> • Student desks were placed in rows • Whiteboards and projector screens • Overhead projectors • Teachers all had computers
Teaching Methods	<ul style="list-style-type: none"> • Established routine • Instructors prompted the students for answers • Emphasized the importance of homework • Used at least one visual representation • Geometry teachers used 3-D objects
Instructional media	<ul style="list-style-type: none"> • All STs & NTs used the whiteboard to demonstrate • 1 ST & 2 NT used overhead projector • 1 ST used computer projection <ul style="list-style-type: none"> • Student study guide containing mathematical vocabulary, visual examples and mathematical problems to complete • 1 ST used handouts created by textbook makers.

Note. ST = sheltered teacher and NT = nonsheltered teacher

other, or in groups, to help each other with the language and mathematical problems. The teachers slowed their instruction, at times, for the paraprofessional translating questions for the teacher that were asked by the students. During one observation session, it was noted that the students asked the teacher to slow down four times during instruction. The teachers actively managed the level of socialization among students both preceding and following instruction. Students talked more before, during, and after the teacher's instruction compared to nonsheltered classrooms observed.

One paraprofessional was present within two of the sheltered classes who translated student questions for one of the teachers during classroom instruction. Some

students would ask the paraprofessional a question in Spanish when asking the teacher in English became a struggle. The paraprofessional translated the question to the teacher who answered the question in English, which was subsequently translated by the paraprofessional back into Spanish for the students. One paraprofessional took notes during the instruction delivered by the teacher, and in the other classes, walked through the class helping the students while speaking in Spanish. On the particular day the sheltered classrooms were observed, only two of the classes had a paraprofessional available to assist the teachers and students during instruction. Two of the sheltered classes did not have a sufficient number of students to justify a paraprofessional on a daily basis. These classes had fewer than 15 SSs with a paraprofessional present on alternating days. Students were observed asking the teacher if the paraprofessional would be back the next day to help them with the assignment in the class observed without the paraprofessional. Table 11 provides a summary of the four themes found during the sheltered classroom observations.

Table 11: Sheltered Classroom Observation Themes

Themes	Sheltered Classroom Observations
Language	SSs spoke in Spanish except when talking to the teacher.
Teaching methods specific to LEP students	<ul style="list-style-type: none"> • STs slowed down instruction. • SSs sit close to each other to help each other with the language and mathematical problems.
Classroom management	<ul style="list-style-type: none"> • SSs socialized in Spanish & talked more than NSs
Teacher and student support	<ul style="list-style-type: none"> • 2 paraprofessionals in 2 of the 3 classes • 1 paraprofessional translated student's questions to the teacher. • 1 paraprofessional walked through the class helping the students while speaking in Spanish. • SSs asked when the paraprofessional would return

Note. ST = sheltered teacher, SS = sheltered student, and NS = nonsheltered student

Teacher and Student Interviews

The student and teacher interviews conducted for this research began upon completion of the classroom observations. Data were analyzed using the phenomenological approach described by Creswell (2003). The interview data were first processed through adherence to the following four steps:

1. Each interview was audio recorded with supporting field notes.
2. Each interview recording was transcribed verbatim.
3. Each interview participant verified his or her interview transcription for accuracy.

4. Each interview transcription was reviewed twice to develop a sense of the complete lived experience.

The study interviews sought input from both students and teachers describing the learning environment and their individual experiences within that environment. Data were initially analyzed by individual and subsequently by the group as a whole. Each interview transcription was analyzed using a modified version of the Stevick-Colaizzi-Keen method of analyzing phenomenological data (as cited in Moustakas, 1994, pp. 121–122). The experiences of the researcher were first fully described. The examination of the interview transcripts involved the following steps:

1. Each interviewee statement was considered in terms of its significance in the overall description of the respective experience.
2. All transcripts were examined and all statements relevant to the experiences of teachers and students of the participating sheltered and nonsheltered mathematics classes were recorded.
3. Nonrepetitive and nonoverlapping statements were listed and grouped into meaning units relevant to the experiences of the teachers and students of the sheltered and nonsheltered classes.
4. The meaning units were clustered into themes common to the experiences of teachers and students of the sheltered and nonsheltered classes.
5. Both the meaning units and themes were synthesized into textural descriptions describing the experiences of the students and teachers including verbatim examples.

6. The researcher reflected on the textural descriptions to construct an overall description of the structures of the experiences of the students and teachers.
7. The textural descriptions were examined for various perspectives and possible meanings were explored to more fully detail the sheltered and nonsheltered experiences of the study groups.
8. An overall description was derived of the meanings and essences between the experiences of the teachers and students of the sheltered and nonsheltered classes.

Final descriptions from the interviews were derived via a comparison of the findings. The individual teacher and student interview descriptions were used to construct the overall description of the experience. The exact wording of the interview responses was drawn from the session transcripts; however, specific references were removed that would compromise participant anonymity. Individual transcripts were not published, and participants were referred to as SSs for sheltered students, NSs for nonsheltered students, STs for sheltered teachers, and NTs for nonsheltered teachers to protect their identity.

Research Question 3

Research Question 3 asked, “What are the teachers' attitudes of the mathematics classes in sheltered versus non-sheltered environments?” The interviews produced 68 nonrepetitive and nonoverlapping statements between the three sheltered-teacher (ST) and three NT participants. One to five statements were repetitive among and between the class types (i.e., sheltered and nonsheltered); however, all statements were treated as equally important in the final analysis. The statements described the attitudes of the

teachers surrounding limitations of the classroom environment and gleaned their recommendations for an improved environment. The following five similar themes emerged from the examination of ST and NT attitudes: (a) support systems, (b) teaching methods, (c) student mathematical skills, (d) instructional media, and (e) student attitudes toward mathematics. The additional theme of language emerged exclusively for STs.

All six of the identified themes were used to construct the overall description of the experiences of participating STs. The structural description is summarized in the following list:

1. Additional support systems are desired for assistance with student achievement.
2. Additional instructional techniques to support the development of student mathematical skills and language acquisition are desired.
3. Teachers are challenged by the student lack of mathematical skills.
4. Additional instructional media used to provide practical and motivational instruction are desired.
5. Teachers are concerned over the lack of student effort to practice mathematics outside the classroom.
6. Teachers are concerned over meeting the needs of LEP students due to the language diversity within their classrooms.

Support Systems

All three of the STs participating in this study agreed that additional support within the classroom was needed to meet student needs. Support suggestions were a

paraprofessional, coteacher, or bilingual mathematics tutor within the classroom on a daily basis. Rationale behind this need was to improve student mathematical skills, monitor student socialization, and reach each student of large classes. Existing paraprofessionals were perceived as providing assistance; however, the teachers felt more are needed. One teacher within a sheltered classroom, identified for purposes of this study documentation as ST-1, expressed this need by stating in an interview, “Yes, we have paraprofessionals in the rooms, but we do not get time with the paraprofessionals to really plan anything, or to talk to them.” Two other STs, who did not have the support of a paraprofessional on a daily basis, felt this to be a strong need. As ST-2 stated in a study interview,

If that person was there every day, we would be able to emphasize word problems to a greater extent, which would ultimately. . . . I am not saying [it] help student achievement, but [it] would give the appearance of helping achievement because, ultimately, it would aide them on the FCAT [Florida Comprehensive Assessment Test].

Another ST recommended two paraprofessionals within the classroom on a daily basis to help keep students on task. The following interview comments were made by ST-3,

Possibly, at least two in a class. I know that I would not get more than that, but if I could get two, that would allow us to basically “corner” the classroom where they [students] could have no possible way of finishing their conversations about other things than math.

Support other than paraprofessionals was also mentioned by two of the STs. One felt that the role of a paraprofessional, which is not an instructional position, was insufficient to meet the mathematical needs of all students. As ST-1 stated, “If we cannot limit the class size, or we cannot restrict the class size, then having two teachers in the

room will benefit. . . . The paraprofessional in my room is knowledgeable, but her position is not to be actively teaching.” Another recommendation was to have bilingual mathematics tutors continuously help students with their basic mathematical skills as assignments progressed. The following interview comments were made by ST-3:

In my opinion, they need to bring in at least one or two people that are math bilingual, and there would be a math-tutoring situation where they are going to work in conjunction with your classes to help you [the students] understand everything that you are doing at the current time or in the future.

The STs expressed the need for additional paraprofessionals, coteachers, and mathematics tutors. However, the support systems recommended by NTs were different. All three described the extra mathematics assistance they gave students both during and after school. They supported the following interview comment made by NT-1: “I am more than willing to help you [the students] in any way, shape, or form.” Two teachers commented on the lack of parental support and one spoke of using peer tutoring in an attempt to fill this void. One of them, NT-2, described efforts via e-mail to parents to garner their involvement in the mathematics achievement of their children. She explained the lack of parental support in the following interview comment:

I do not understand, as a parent, how you are not “up on top of things.” Especially, after they come home with their report cards. How come, after report cards, I do not have a ton of phone calls? I don’t have any!

This teacher recommended that parents learn how to provide guidance. As NT-2 stated,

I wish, if I had no limitations, I would love that it was required before a kid can start high school that their parents have to come in for a class to learn how to be parents of high school students.

Parental support was also addressed by NT-1, but she perceived that such outside support could not be controlled, as is evident in the following interview comment: “Now what else results as far as outside of school in response to your actions or your lack of actions in the school are out of my control.”

Peer tutoring was another type of support recommended by NT-3. He described his rationale for this in the following manner:

You know what would be [a] nice thing to see in the high school’s classes, where they have the “top-notch” kids, and kids in those classes go to different math classes and are peer math tutors. Because students learn better from other students, and if you get the top-notch kids, they are going to know. The one thing that happens between both students is the idea of how do you communicate with different level students?

Teaching Methods

The STs interviewed for this study all spoke of slowing down the pace of mathematics lessons. They were concerned over meeting district mathematics requirements (i.e., designated chapters in the textbook and the district test). Slowing the pace toward completion of the mathematics requirements set by Orange County Public Schools [OCPSs] was another concern for ST-1. She stated,

Even though I have a sheltered ESOL [English for speakers of other languages] class, they have to take that same final. Whatever grade they get on that final is going to affect their [overall] grade. That is 10% of their grade for the whole year. Otherwise the students that are “up to par” with their skills are going to miss out, and their grade is going to suffer.

A concern expressed by ST-2 was for students with mathematical skills higher than average when the lesson pace was slowed. She was opposed to separating students only

by language ability, which was standard practice within the study site. ST-2 views both mathematical and language ability as a more logical criteria for separation. She stated, “So the students that needed a slower pace in ESOL [mathematics] get it. Students that needed the mainstream pace in ESOL [mathematics] would get it.”

Only one sheltered educator spoke of the teaching methods used in terms of affecting student performance on the FCAT. She described her limitations with non-English primary languages when trying to teach word problems to students, and the strategies she used to reach the students using English. The following interview comments were made by ST-2,

Well, one limitation is my language. The way I compensate for it is I avoid doing what would be more confusing for the students. What I avoid doing is unfortunately something that they get graded on in the FCAT. The FCAT is primarily word problems. They are word problems, and I am teaching concepts. Sometimes I can put them into word problems, but with a lot of words, it is one more thing for the students to get confused about.

Group work was another teaching method discussed in the interviews of two STs. One described her desire to have students work within groups; however, physical space, coupled with class size, did not render group work feasible. Describing the classroom limitations, ST-1 stated, “The physical space makes it difficult—just too many [students] to move around the classroom.” Small groups were used in the class taught by ST-3 so the students could help each other with language deficiencies. He explained, “I have to use the partner “buddy system” in order to get them into the class and understand all of the material.” This teacher also described concerns with group work including student socializing rather than completing mathematics assignments. When asked if this made

group work unsuccessful for his class, ST-3 responded, “It started out that way. Unless I am sitting right on top of them . . . and then they are talking in their native tongue. I do not have any idea what they are talking about.”

In summary, the STs expressed concern over slowing down the pace of their classes, word problems, and group work. Only one NT mentioned slowing down the class pace and two commented on group work. NT-2 voiced her concern in the following manner:

Do I push through so I can say that I completed that work, and they don't really get anything, or do you slow down and take your time, and try to make sure that they learn it? But then the county is saying you have to be here, at this point, because you are going to get tested and the county gives us the final exam.

Participating teachers expressed varying thoughts regarding group work. NT-3 described his related attitude by stating, “You know, each student is going to learn differently, but the ones that never got reached before, got reached. Just to mix it up a little bit.” Another teacher views the time available for class as a limitation. As NT-1 stated, “By the time you get everything prepped, started, and ready to go, when you make your point, the bell is ringing.” Another concern for this teacher was group work and students not participating and off task.

Student Mathematical Skills and Instructional Media

All of the STs expressed uncertainty with regard to the mathematics students are taught within other countries. The three STs interviewed in this study questioned whether the quality and pace of foreign mathematics education matched that required within the United States. As ST-2 stated, “Many students come to us with a lack of skills, especially

ESOL students that come from very many countries where their progression is at a [different] pace than us.” ST-1 was concerned that the students were not accustomed to how mathematics were taught in the United States when she said, “I don’t know how it is taught in other countries . . . or [if] they are not accustomed to seeing it on the board and comparing their work, or if everything looks foreign to them.” The following interview comments were made by ST-3 describing his problems encountered with basic foundational skills,

I am having problems with a lot of these guys with basic multiplication tables. That is a definite hindrance, and then getting through any of this in a timely fashion, because they cannot do regular math. Basic math, of course, is an afterthought when you are dealing with these problems. You should not have to think about it.

All of the NTs participating in the study interviews also commented on the lack of student preparation for the classroom in terms of basic skills. As NT-3 reported, “I was limited by the material and the pace that I wanted to go because the background of the students’ mathematics was not where it should have been.” The NT-1 commented, “My biggest challenge is the simple fact that kids are coming in with a very weak foundation of basic math—multiplication, division, and stuff that should come second nature to them.”

All three of the STs recommended the use of more advanced technology within classrooms. Two of the teachers commented on using a computer versus an overhead projector. The computer projector was viewed as an improvement due to the optional instructional methods it supports. As ST-3 commented, “Not every day, but yes, certain times it would be a change. They are seeing something different every day.” Another ST

commented that a computer lab might prove to be a powerful learning resource. Teachers could easily monitor student use and incorporate their work into class problem-solving activities. As ST-1 explained,

I can see this person got it wrong. Let's put it up on the board. Or I see your graph is tilting this way. Can someone see where they went wrong, or if they are not interpreting correctly? What happened? I think that can be very powerful.

Only one of the NTs commented on using more technology within the classroom. This teacher believed that computer projectors using different types of software could assist with group projects and render lessons more interesting. As NT-3 stated, "Just to 'mix it up' every once in a while would be nice."

Student Attitudes Toward Mathematics

All three of the STs interviewed for this study spoke of the challenge of simultaneous learning for their students (i.e., mathematics and English). As ST-1 described, "So it causes a lot of frustration for them when they do not know the language, and they are fighting to learn it." Other comments were directed toward student frustration with being behind due to undeveloped skills. The ST-2 explained, "Well, the students with the lesser skills feel very strained, frustrated, and find it is easier to give up and say they can't do it [rather] than to try." Only one ST spoke of student attitudes toward their mathematics work, which was a frequent topic of discussion in interviews conducted with the NTs. All of the NTs agreed that they would like to have students put forth the effort to complete the work. The NT-1 described her experiences with student attitudes toward homework when she stated, "Homework to them is not something that

they value. They do not think that it is important in any way, shape, or form.” She went on to describe student attitudes toward mathematical work.

Their behavior . . . their attitudes towards the work . . . their abilities. Because I do not think that I really have kids that I look at and go, “Oh my, there is absolutely no possible way that you can do this.” But I have several kids that they need to put in more time and more work and more effort, and they are not willing to do that.

The need for students to invest the effort to overcome their lack of skills and negative attitudes toward tests were a concern for NT-2. She stated,

Also, obviously, they do not feel good about themselves about math. So when you do not feel good, you shut down. So trying to get them to try. . . . I understand that you are frustrated. That is fine, and understandable, but there has to be a solution to this. You just cannot compound the problem by not doing anything. There is that gap between where you need to be and where you are that continues to get bigger and bigger. Somehow we have to narrow that gap. You have to work hard.

This teacher also described what she believes contributes to student attitudes surrounding mathematics testing, stating, “Because a lot of them have been told by someone, somewhere along the line—parents, a teacher, a counselor—that you [the student] are not a good test taker.”

Language

Teacher language differences presented an additional theme from the NTs. All of the STs concurred with the following comment from ST-1: “I think that my ideal classroom, ideal situation, would be me learning Spanish.” The STs perceived their nonbilingual status as a limitation with regard to student learning and classroom management. Two of the teachers commented that not knowing the content of student conversation renders it difficult to determine when students are socializing or making

comments that do not pertain to the lesson at hand. As ST-3 described, “I do not have any idea what they are talking about, which I have told them is not too polite to do because someone does not know what you are saying.” Table 12 provides a summary of the six themes found during the sheltered and nonsheltered teacher interviews.

Table 12: Sheltered and Nonsheltered Teacher Interview Themes

Themes	Sheltered and Nonsheltered Teacher Interviews
Support	STs all wanted more support. NTs comments varied. NTs all spoke on extra support they provided.
Teaching Methods	STs all spoke on slowing the pace. One commented on not emphasizing word problems & two spoke on the limitations of group work. All NTs comments varied towards group work.
Student Mathematic Skills	All STs & NTs spoke on the lack of student’s skills.
Instructional Media	All STs recommended more advanced technology (i.e. computer projector and lab). One NT commented positively on using technology.
Student Attitudes	All STs spoke about the student’s frustrations of learning two subjects simultaneously. NTs all spoke on the lack of student effort.
Language	All STs desired to be bilingual.

Note. ST = sheltered teacher and NT = nonsheltered teacher

Research Question 4

Research Question 4 asked, “What are the students' attitudes of the mathematics classes in sheltered versus non-sheltered environments?” The six students interviewed for

this study contributed 79 nonrepetitive and nonoverlapping statements. Many statements were repeated across class types (i.e., sheltered and nonsheltered). The students repeated one to four statements among and between the class types; however, all statements were treated as equally important in the final analysis. The participants described their feelings surrounding mathematics and the FCAT, and they provided recommendations of things that would support their learning. The following five similar themes emerged from an analysis of student attitudes across the participating sheltered and nonsheltered classrooms: support systems, teaching methods, student mathematical skills, instructional media, and student attitudes surrounding mathematics. The additional theme of language emerged exclusively for SSs.

All of the six themes described were used to construct the overall description of the SS experience. The structural description is summarized as

1. Support provided.
2. Teaching methods experienced.
3. Lack of skills needed for the completion of mathematics requirements.
4. Class materials.
5. Student attitudes toward their mathematics classes and the subject area.
6. Simultaneous learning of subject matter and language.

Support Systems

All of the SSs commented on the support extended by the paraprofessionals within their classrooms. These paraprofessionals were perceived as helpful by all of the

SSs. As SS-1 succinctly stated, “She explains it to me,” when describing the paraprofessional support. The SS-2 described her positive perception of a classroom where the teacher speaks in English and the paraprofessional is there to support with translation when needed. She was asked if teaching in both Spanish and English was her preference and she replied,

No, English. And the other teacher, like [paraprofessional], she help us a lot. She is all the time there for us, like, “You need something? You need something?” You know. She really good teacher. So, for me, I think it is better in English.

Both SSs and NSs referred only to the support they received within the classroom. Two NSs commented on teacher support. The NS-1 stated, “And he is always been there if I need help. He is always helping me out.” Both commented on how the teacher prepared them for tests by teaching the skills needed. The NS-2 described the support of her teacher by stating, “Cause at the end of the year, like, what our teacher is doing, he is starting to go over more [mathematics] stuff for our [mathematics] class next year. [The teacher] wants us . . . me to pass.”

Personal communication with the Curriculum Compliance teacher for LEP students at the high school revealed that SSs were offered mathematics tutoring after school with both paraprofessionals and peer tutors that spoke Spanish. The mathematics team leader at the school also stated that NSs were offered tutoring after school with a mathematics teacher. Students attending the tutoring sessions were provided transportation, which was arranged by the school principal. Both the Curriculum Compliance teacher and mathematics team leader stated that not enough students were taking advantage of the tutoring and attendance was low.

Teaching Methods

The SSs commented on various teaching methods they liked and those they did not like. Two voiced their dissatisfaction with the methods used to prepare them for the FCAT. As SS-1 explained, “How I learned them is different than what is on the FCAT. Kind of a problem.” The SS-2 further explained how the practice test administered within the classroom seemed different to her, stating, “Cause when they give you the test you, like, so different that the teacher give it to you. For me it is, like, cause [the teacher] do like [one] way and the FCAT do another.” Two of the SSs commented that they liked what the teacher planned for the class. As SS-3 stated, “I like how the teacher plans things in the classroom.” Only SS-2 commented on the teacher needing to slow down the pace. She reported, “I say all the time that we are different ‘cause we are ESOL. We take it slow.”

Similar to the SSs, NSs commented on various teaching methods they either liked or disliked. As NS-3 commented, “I need a very slow pace because it takes me a long time to comprehend even one problem that [the teacher] solves.” Two of the NSs described teaching methods that were positive for them. The following interview comments were made by NS-2,

I ask the teacher to give me examples because that is the way that I learn. I have many examples given to me, and I see the way that it is done in different ways so that, when I run into that problem, that way I can do it. But if you just say it or just read it, I won’t understand it. I have to clearly be given an example.

One NS-1 viewed the method used by her teacher to explain content as positive to her learning experience. She described it by stating,

A lot of teachers have different methods like ways to do math. [The teacher] sticks to the easiest one you can do and to one certain topic. That is what I like a lot; [the teacher] sticks to one thing instead of so many to choose from. . . . [She teaches] the easiest steps to do that problem.

Two of the NSs expressed their positive views surrounding group work. As NS-1 commented, “I would like a little more group work, so you can get to know each other more, and help each other more.” When asked if she learned more within a work group, NS-2 replied,

In some ways, yes. Sometimes I didn’t because I would be distracted sometimes by the other people [within our group]. So there are “ups and downs” about group work. Other than that, I like it more than dislike it. . . . We were all friends pretty much; we knew each other pretty well. We would go off topic sometimes. That’s the only downfall.

Student Mathematical Skills and Instructional Media

All of the participating SSs spoke of problems they experienced in classroom tests and/or the FCAT due to lacking mathematical skill. As SS-3 explained, “When you use A and B—you know, letters—I get confused. . . . I don’t understand the [classroom] test . . . I fail a little bit of it, or parts of it.” All three of the SSs interviewed for this study commented on their comfort with the reading and writing sections of the FCAT. Two students had difficulty understanding the mathematical word problems of the FCAT. When asked if she viewed the word problems as the most difficult, SS-1 replied affirmatively and also confirmed that her English reading is very good. However, she found the math word problems overly difficult. The SS-2 described her views of the FCAT and its mathematical word problems in the following manner:

It is too hard. For me, the math part was too hard. I do not get nothing . . . about

math, only like the little questions. . . . [The] writing part, it is easy for me. I do not know why. But the math part is too hard.

Unlike the SSs, all three of the participating NSs were confident in their mathematical skills upon completion of the FCAT. As NS-2 stated, “FCAT, I do not enjoy. Although I do well on the math . . . because it is not more so algebra, it is more mathematics, and I am really good in math.” All of the NSs commented on problems with algebra skills. The NS-3 stated, “I do not know why that has letters in math problems.” The length of mathematical problems was revealed in the following interview statement as a concern for NS-2: “When it is a problem, for instance, and it is difficult when it is extremely long.” Here are NS-3 words describing the change he felt as he progressed to algebra, “Big. Huge! . . . The problems are very long.”

The lack of educational preparation for algebra was described by two of the NSs.

The following interview comments were made by NS-2,

I actually did not take an eighth-grade math. My teacher got sick in the beginning, and we had substitutes throughout the whole year, and then the last 9 weeks, we finally got a new teacher. So we did not do anything throughout the whole year. . . . [Upon entering the ninth grade] I was behind. I fell very behind. We should have been covering algebra. I think that is why I am not very good at algebra, because we never even went over a hint of prealgebra.

The NS-1 described how moving to another state and changing schools affected her mathematics education in the following interview excerpt:

Yeah, I did [feel left behind]. Some things, like in New Jersey, they are more behind than they are in Florida. I have had to learn a lot more things when I got here, but I got kind of used to it.

Each of the participating students within the geometry sheltered and nonsheltered classes commented on experiencing greater difficulty with the algebra portion of geometry

problems. Algebra was difficult for the students; their comfort level was greater with geometry than algebra. As one student stated,

The Algebra is just hard for me as an individual. It has never been something that I have understood. Like there is so many different things that you have to memorize, I do not know. It is just really hard for me. . . . When it comes to the algebra part of geometry, I do not do so well.

The SSs who participated in this study were happy with the textbook, handouts, and/or projected images used within their classrooms. Only SS-1 expressed a desire for additional technological resources within her classroom. She explained that a greater number of computers would be helpful when searching for information on word problems. Similar to the sheltered participants, NSs liked the instructional media implemented within their classrooms, with the exception of one student. Information written on the class whiteboard was too hard for NS-3 to see from his seat. He reported, “Sometimes, I have to get up and move. If there are no seats, I will just sit on the floor, or I will sit somewhere else to comprehend.”

Student Attitudes Toward Mathematics

Attitudes toward mathematics and their classrooms varied among the SSs. Some stated they liked mathematics and others did not. The following interview comments were offered by SS-3: “The problem is that I do not like math. When you don’t like something, you don’t pay attention, or you pay attention and it is like ‘aha, aha,’ and that is it.” Another SS did not like the attitude of her teacher, perceiving the teacher was not happy teaching the class. Two SSs spoke of their attitudes toward homework. As SS-3 stated, “I do my homework sometimes, when I remember, but I fail the test.” Conversely,

SS-1 liked mathematics and described the benefits of homework by saying, “Helps me practice more at home things that I don’t understand in class.”

Similar to the sheltered participants, the interview comments of NSs varied in terms of their “taste” for mathematics. The following interview comments were offered by NS-2 “For me, it is a lot to remember at once. It is so much work . . . I do not know. It is so difficult almost.” As NS-3 stated,

It is me and numbers. We do not connect. . . . I hardly ever do it, because I can hardly ever . . . I will go and look at the homework and I will be. . . . “Okay, I will take notes and I will look at my notes,” and I still will not know. “The book will give you examples,” and I still cannot deal with that, and it is just hard.

Here is an excerpt from NS-1s interview about how she changed her attitude towards mathematics.

I guess I did not like math before, and I was, like, “I can’t see the point of math.” I always hated math. . . . I have had teachers that put me down before. I have had strong friends who put me down by saying . . . “You will not get what you want. You will never get to what you are studying,” because I am going to study design engineering. I really like engineering. You need a high level of math to do that. I am working pretty hard. They have always put me down by saying, “You will not make it as far as you think.” I was tired of hearing so much stuff, and you know what? I am not going to listen to what other[s] think anymore. I am just going to hold on tight and go as far as I can on, try to do the best that I can.

Language

Language differences presented an additional theme from the NSs participating in this study. A variety of subtopics emerged related to language: desire to learn English, family support for learning English, and problems SSs encounter in the classroom. All of the SSs commented on wanting to learn English. The SS-2 described why she viewed learning English as important, stating, “I think that when you [are] going to go [to] UCF,

the college, you do not got nobody speak Spanish there. It is only English, so this is the time to learn that.” The SS-1 revealed that she liked learning mathematics within a sheltered class “because I understand more English than Spanish.” When asked if she read Spanish material, she responded that she did not; hence, her English is much better. Another SS expressed liking his classroom environment. This student described the different LEP mathematics classrooms he experienced within other U.S. schools and compared them with his current sheltered class. Here are SS-3's words describing his experience.

Here, it is different. The teacher only speaks in English, and they have somebody that translates for you. . . . It is better, because if the teacher only speaks in Spanish, you are not as interested in learning more English because you understand already what he is saying. If it is in English, you can at least try to understand what they are saying.

Two SS participants spoke of their home support with learning English. As SS-3 reported, “We only speak English. We speak English in the house most of the time. It makes it easier for me to learn English.” In contrast, SS-2 described problems with switching between English within the school and Spanish at home. She stated,

‘Cause sometimes, I do not understand some words in Spanish ‘cause now some other times I speak English . . . and when I go to my house, I was, like, “Wait,” ‘cause, in my house, I speak Spanish ‘cause my mama likes to speak Spanish. So I was, like, “Wait, wait, wait, say that again ‘cause I do not understand.” It is better for me [in] English.

Two of the SSs commented on various problems encountered in the classroom with students speaking a different language. One of the SSs commented on a problem with the time lag experienced while trying to translate teaching delivered in English. As SS-3 explained, “There are little words that sometimes I do not understand at first. I have

to think to realize what [the teacher] is saying or what it is about.” Another student expressed a problem understanding the teacher when SS-1 stated, “I get part of it, but then later, I do not understand the other one, cause [the teacher] is too fast. I was, like, ‘Wait. Can you repeat?’”

Disrespecting the teacher was a second problem reported by SS-3. When asked for additional support he would like to have within the classroom, he replied, “Do you mean, tell people to respect the teacher?” When asked how he felt that could be changed, he replied,

You know that [the teacher] does not speak Spanish, and you are going to start talking about [the teacher] because [the teacher] does not understand. [The teacher] understands Spanish, but bad words or something like that [the teacher] does not understand, and they, most of them, talking about [the teacher] and that is the point. If [the teacher] understands, I think [the teacher] is going to get mad or say something, but [the teacher] doesn’t understand and nobody wants to “snitch.”

A third problem expressed within the study interviews related to misunderstandings that occur within the classroom due to the various native languages. When asked if it would make a difference for the teacher to know what students were saying in their native languages, SS-2 stated,

Yes, sure, ‘cause all the time I am talking in Spanish ‘cause they are ESOL students. They understand Spanish. So that is hard for me, too, ‘cause the teacher they think, you know, when you are talking to your friends in Spanish and you say something, they think it is bad. That happened to me in my last year. In my other school, that happened to me, and that got big deal for nothing. I must of say a thousand times what I say in Spanish, but they don’t believe me.

Student attitudes toward learning mathematics and English within the classroom was the last problem that emerged within the student interviews. When asked if other students

were talking in Spanish because they were trying to understand the math among themselves or if they were just socializing, SS-3 replied,

Yes, most of them understand, but they are just acting stupid. They say that, if they look like they do not understand, they are going to do better. You are not going to get better when you try to act stupid. The point is to learn English so you can get the point of what she is saying, and they just act stupid.

Table 13 provides a summary of the sheltered and nonsheltered student interview themes.

Table 13: Sheltered and Nonsheltered Student Interview Themes

Themes	Sheltered and Nonsheltered Student Interviews
Support	All SSs liked the paraprofessional. Two NSs spoke on the teacher's support. After school mathematics tutoring & transportation was provided.
Teaching Methods	Two SSs dissatisfied with methods to prepare for the FCAT. Two SSs & NSs spoke positively on what the teacher planned. One SS & NS wanted a slower pace.
Student Mathematic Skills	<ul style="list-style-type: none"> • FCAT word problems were difficult for two SSs. • One SS & NS had problems with letters used in math. • All NSs were positive about abilities to complete the FCAT & spoke on problems with Algebra. • Two NSs felt that their previous math learning did not prepare them for Algebra I in high school.
Instructional Media	All SSs & NSs liked the media used. One SS wanted additional technological resources & one NS had problems seeing the whiteboard.
Student Attitudes	Both SSs & NSs varied in attitudes toward math and completing homework. One SS commented on the teachers attitude.
Language	All SSs spoke on the desire to learn English. Two SSs commented on family support, student behavioral problems in the class & misunderstandings in the class for 2 nd language learners.

Note. SS = sheltered student and NS = nonsheltered student

Summary

The analysis conducted of the study findings used descriptive information drawn from quantitative and qualitative data. Student surveys (i.e., the WIHIC instrument), student and teacher interviews, and classroom observations comprised the mixed method used to investigate the attitudes of LEP students surrounding their learning environments. Quantitative data from student perceptions of the classroom were measured using the WIHIC instrument. A two-sample t test was conducted to compare student attitudes. Cooperation was the only scale within the WIHIC found to draw scores statistically significant in terms of the difference between SSs and NSs. However, scores drawn from four other scales were found to be statistically significant in terms of the difference between the geometry and algebra classes. These were the Teacher Support, Involvement, Cooperation, and Equity Scales.

Sources of qualitative data included classroom observations and student and teacher interviews. The interviews used a phenomenological approach that examined student and teacher attitudes of the classroom environment. Five similar themes were found from the study interviews—support system, teaching methods, mathematical skills, instructional media, and student attitudes toward mathematics. The additional theme of language emerged exclusively for STs and SSs. Accuracy of the observations, interview, and WIHIC findings was confirmed using triangulation (Creswell, 2003). All of the participating teachers within sheltered classrooms expressed the need for greater support to help students with their mathematical skills and language development. The SSs interviewed commented positively to the support extended by the paraprofessionals

within their classrooms. During classroom observations, paraprofessionals were present in two of the nonsheltered classrooms. Students in the sheltered class that did not have a paraprofessional asked the teacher if the paraprofessional would be back the next day to help them with the assignment. Support systems commented by NTs and their students differed. All NTs described the extra mathematics assistance they gave students both during and after school. Two NSs interviewed referred to the additional help offered by the teachers, reporting that it helped them to accomplish their class goals. Teachers were observed in two nonsheltered classes announcing times to the students when they would be available to assist them outside class time.

A variety of subtopics emerged related to teaching methods. Sheltered and nonsheltered classrooms observed used teacher directed instruction, and student involvement was limited to question-and-answer sessions for the mathematical problems addressed during classroom instruction. All participating STs and one NT mentioned the need to slow the pace of instruction and concerns with meeting the district's mathematics requirements. During one sheltered observation session, it was noted that the students asked the teacher to slow down during instruction. Two SSs interviewed voiced their dissatisfaction with the methods used to prepare them for the FCAT. The NSs interviewed differed on their comments about teaching methods, but none mentioned the teaching method used to prepare for the FCAT.

Group work was another teaching method expressed by teachers in sheltered and nonsheltered classes. Comments towards group work differed between and among the STs and NTs. The STs were positive about using it, but one had reservations due to the

physical space and number of students in the class. Only one NT was positive about group work and used it. The other NT felt that group work could lead to students socializing and not staying on task. Some SSs were observed working in groups or sitting closer to each other within their classrooms and STs invested a greater amount of time in managing the level of talking in their classrooms. Conversely, the NSs sat in rows and minimal verbal interaction was observed. Talking among NSs observed was primarily in response to questions directed from the teachers.

Both sheltered and NTs commented on the lack of mathematical foundation skills evident in student work and the challenges of teaching these students. Interviews with SSs revealed that two of the students felt unprepared to complete the FCAT, because of their difficulty with mathematical word problems. During observation of the sheltered classes, only one included language (i.e., vocabulary) as part of the lesson. Unlike the SSs, all three of the NSs interviewed were confident in their mathematics skills to complete the FCAT, but did not feel prepared to begin algebra for a variety of reasons.

Use of instructional media was mentioned by all of the STs participating in this study and one NT. These teachers recommended the uses of a computer projection during instruction for a variety of reasons. The SSs and NSs interviewed were satisfied with the instructional media used with the exception of one student. This NS mentioned that it was too hard to read the information written on the class whiteboard. All of the classrooms observed in this study implemented teacher directed instruction, followed the textbook, and teachers wrote on the class whiteboard. Only the sheltered classrooms used handouts

or study guides that were distributed to students. Furthermore, only one teacher, who taught a sheltered class, used the computer for instructional purposes.

All STs spoke of the student's attitudes towards simultaneously learning mathematics and English. Two of these teachers used the word "frustrated" to describe the students' feelings towards learning two subjects simultaneously and lacking the skills needed for the class. The NTs comments on student attitudes differed from STs. All of the NTs agreed that they would like to have students put in the effort to do the work. Students interviewed in both sheltered and nonsheltered classes varied in their like or dislike of mathematics.

Language differences between STs and their students' was an additional theme that emerged in the analysis of the sheltered classes. The teachers typically wanted the ability to understand their students when they spoke in a different language so they could manage student socializing or comments that did not pertain to the lesson. Two of the SSs commented on various problems encountered in the classroom with students speaking a different language. One SS interviewed revealed how students were taking advantage of their teacher by using words in Spanish that were inappropriate for the classroom. In contrast, another SS commented on how not being understood caused a problem with her teacher. During observation of the sheltered classrooms, students were talking more with each other than was observed within nonsheltered classrooms. Talking among the SSs was primarily not in English.

CHAPTER 5: DISCUSSION

Summary

This study seeks to describe the attitudes of sheltered students (SSs) and teachers within a high school setting toward their classroom environment through the collection and analysis of quantitative and qualitative data. Student surveys, classroom observations, and student and teacher interviews, were analyzed to build substantive understanding of the classroom environment (Fraser & Tobin, 1991; Tobin & Fraser, 1998). The purpose of this study was twofold:

1. To present a complete and coherent description of learning environment attitudes exhibited by Limited English Proficient (LEP) students and their teachers within mathematics classrooms.
2. To identify those components within mathematics classrooms environments strongest association to a positive learning environment for LEP students.

The findings provide new information within the field of learning environments because it is the first time a study has administered the What is Happening in this Class (WIHIC) instrument to compare the mathematics learning environment between SSs and non-sheltered students (NSs) and between algebra and geometry classes. Furthermore, this study adds to the field of research describing the attitudes of LEP students and their teachers toward their environment by triangulating data collected from the WIHIC, classroom observations, and study interviews. Interviews used a phenomenological approach that examined student and teacher attitudes of the classroom environment. Five

similar themes were found from the study interviews—support system, teaching methods, mathematical skills, instructional media, and student attitudes toward mathematics. The additional theme of language emerged exclusively for sheltered teachers (STs) and their students.

The majority of the high school LEP or SS participants in this study spoke Spanish. Purposive sampling was used in this research because the study site offered three sheltered mathematics classes - two algebra classes, and one geometry class. The NS study group was composed of 46 students and 33 students comprised the sheltered group, which provided a total sample size of 79 participants. Three STs and three nonsheltered (NTs) teachers from similar mathematics classes volunteered to participate. The six teacher participants were certified in mathematics, and the LEP teachers had completed the necessary in-service training or equivalent college credit. All of the teachers and the paraprofessionals met the requirements of the No Child Left Behind (NCLB) Act of 2001 and Florida Consent Decree (U.S. District Court for the Southern District of Florida, 1990).

Research Question 1

The WIHIC was administered to draw data necessary to address research question one that asked, “Is there a significant difference in attitudes of the classroom between sheltered and non-sheltered mathematics students?” Student responses were analyzed to differentiate between survey attitudes of sheltered versus NSs toward their mathematics classes (i.e., algebra and geometry). Only the Cooperation Scale of the WIHIC indicated

a statistically significant difference. SSs perceived a greater amount of cooperation within the classroom than did NSs. The Cooperation Scale addresses the personal-development dimension and represents the extent to which students cooperate, rather than compete, with one another on learning tasks (Dorman, 2003). Research indicates that LEP students working cooperatively promote a positive, supportive environment (Montecel & Cortez, 2002; Thomas & Collier, 1997). The socialization process for Hispanic students is one of cooperation and sharing rather than competition (Charbonneau & John-Steiner, 1988). More cooperation was found in the sheltered class, which was revealed and supported by the classroom observations; however, it is inconclusive how much cooperation among the students involved learning mathematics versus socializing since the researcher did not understand the language spoken by the students. The LEP students or SSs were observed working together and talking more than students in non-sheltered classes.

No prior findings exist that can be used to compare with the results of the current study since the WIHIC was not used prior to this study within school environments of LEP students. The findings of this study might be unique to this research because the participating SSs represented primarily the Hispanic population. It is unknown if sheltered mathematics classrooms with groups of students speaking multiple languages would affect the extent to which LEP students work cooperatively. Non-Hispanic students in the sheltered classes were not observed working cooperatively or talking with other students during instruction. These students sat quietly in their seats during instruction and did not associate with the Hispanic students. Sheltered classrooms within the United States are typically composed of LEP students represent diverse languages and

family and cultural backgrounds (Genesee & University, 1999; LaCelle-Peterson & Rivera, 1994; Short & Echevarria, 2004). Consequently, the results of this study might be specific to sheltered classes with primarily Hispanic students. More research is recommended using the WIHIC to measure the learning environment of sheltered students with diverse language backgrounds in sheltered mathematics classrooms.

Research Question 2

Research Question 2 asked, “Is there a significant difference in the attitudes of the classroom between Algebra and Geometry students?” The results of administration of the WIHIC survey algebra and geometry classes indicated a significant difference between these two class types with the following four scales: Teacher Support, Involvement, Cooperation, and Equity. Geometry students perceived a greater amount of teacher support, involvement, cooperation, and equity compared to the participating algebra students. It is unknown whether the student responses between the algebra and geometry classes are unique to this study. No prior findings exist that can be used to compare with the results of the current study since the WIHIC was not used prior to study environmental differences between algebra and geometry classes.

Perhaps the results reflect the varied attitudes of the students toward algebra and geometry, or the varied manner in which their teachers conducted their classes. Teaching methods observed in algebra and geometry classes were both teacher directed. Only the use of visual imagery in geometry differed between the two classes. Visual imagery helped students relate mathematical problems with tangible objects as opposed to

procedural steps demonstrating algebraic equations. Algebra is the first mathematics class taken by high school students. Students struggling with mathematical foundation skills may have more difficulty comprehending algebraic problems and feel frustrated with their first high school mathematics experience. The students' instructors, teaching methods, the content (i.e., algebra or geometry), or a combination of the factors may contribute to the students perceiving a more positive environment in the geometry classes. Further studies between algebra and geometry student's attitudes of the learning environment are needed to determine the factors that resulted in this study's findings of geometry students perceiving a more positive environment.

Research Question 3

Data collected from the sheltered and nonsheltered teacher classroom observation and interviews conducted in this study were used to address Research Question 3 that asked, “What are the teachers' attitudes of the mathematics classes in sheltered versus non-sheltered environments?” Classroom observations and interviews were conducted after the WIHIC was administered. Themes from the classroom observations and interviews were different on a variety of levels. The language difference between sheltered students and teachers affected the differences found between the sheltered and nonsheltered learning environments. The structural description or essence of the lived experience of the participating teachers produced two factors influencing the attitudes of both study samples with regard to the classroom environment – (a) support; and (b) teaching methods.

Support

The STs participating in this study were very concerned over the need for a greater amount of support within their classrooms compared to those NTs. Teachers in sheltered classes desired more support in the classroom (i.e., paraprofessionals) to assist with language issues for student comprehension, mathematical skills, and classroom management. The NTs focused on the additional support they gave to students during and after school. These teachers discussed this extended support during their interviews and were observed reminding students of the additional times they would be available to provide supplemental help. Only one NT interviewed expressed frustration with the lack of perceived parental support. None of the other teachers in sheltered or nonsheltered classes voiced concern with a lack of parental support.

The STs felt that they needed more support than what was mandated by the No Child Left Behind Act of 2001 and the Florida Consent Decree. These teachers felt overwhelmed with the additional responsibility of teaching students that speak a different language, lack of student foundation skills, and the need for these students to pass the Florida Comprehensive Assessment Test (FCAT) for a standard diploma. All teachers participating in this study voiced a common concern with fulfilling all of the districts mathematics objectives given the lack of student foundation skills. Furthermore, STs expressed frustration with the additional challenge of the student's language differences. One ST felt that more support would help with emphasizing word problems and could aide the students in the mathematics section of the FCAT.

Research has found that students take between 5 and 9 years to reach on-grade-level performance in a second language used for academic purposes (Thomas & Collier, 1997). The LEP students that first enter the United States during elementary or primary school years have time to acquire the academic language skills needed for standardized tests such as the FCAT. Students first entering the United States during their high school years do not have 5 to 9 years to acquire academic language skills before graduation. Sheltered high school teachers in Florida have additional responsibilities of helping students acquire the mathematics skills to pass the FCAT so these students can graduate with a standard diploma. As the number of LEP students grows in the United States, the need to investigate the amount of support needed for high school teachers and their students to help close the achievement gap between LEP students and their peers is recommended.

Teaching methods

A variety of subtopics emerged related to teaching methods: instructional pace, group work, and instructional media. Both STs and NTs were observed practicing teacher-directed methods and interaction between the teachers and students was primarily in response to questions directed from the teachers. The STs did, however, incorporate supplemental methods to support the needs of LEP students. One such method discussed by all of the STs interviewed was they needed to slow the instructional pace for greater clarity and meaning for LEP students. Slowing the instructional pace is needed to assist the students in understanding the mathematical problems explained in English by the

teacher. The STs understood this need to slow the instructional pace, but were concerned with not having the time to complete the mathematics objectives to meet the district's mathematics requirements (i.e., district's end of the year mathematics test and the FCAT).

The second subtopic that emerged was group work. The STs were positive about using group work as an instructional strategy, and NTs had mixed feelings toward using the method. One ST expressed the desire to try a group project, but felt that the physical space was not supportive. Students in the sheltered classes were observed sitting close to each other or working in groups to help each other with the language differences, but these students were not engaged in a group project. Students were only completing the individual assignments given by the teacher. Teachers encouraged students to sit together for the purpose of helping with language differences, especially when a paraprofessional was not present to assist in the class

Research indicates that LEP teachers need to encourage their students to interact with their peers, discuss ideas, and work on projects that help them understand the content covered in class (Short & Echevarria, 2004). Students working on group projects need to incorporate English skills as part of the project to increase their language acquisition in mathematics. Teachers in sheltered classes need to use effective methods that incorporate language and content before attempting group work. Only one sheltered class observed incorporated language and content with the use of instructional media. This ST used a computer projection of a student study guide that contained mathematical vocabulary terms, visual examples (i.e. graphics), and mathematical problems to complete.

Instructional media was the last subtopic that emerged. Both STs and NTs used the whiteboard and some used an overhead projector for instruction. Only STs used handouts or study guides to assist the students. One ST observed used handouts or study guides that incorporated vocabulary terms and used a computer projection of the handout for instruction. This teacher projected a study guide on the whiteboard with vocabulary terms for the students to write. Using a computer-generated document allowed students to read the terms with ease. It was not feasible for the teacher to write and rewrite the vocabulary terms for each class due to the brief amount of time between classes. There was also an insufficient amount of space on the whiteboards for all of the vocabulary to be displayed together during instruction. This teacher's method of using the computer projected study guide provided an efficient method of delivering language and subject content simultaneously. The method implemented various sheltered instruction observation protocol (SIOP) instructional strategies unlike the other two STs who were observed. The SIOP model is recommended by the Florida Department of Education (FDOE) office of Multicultural Student Language Education for best practices within sheltered instructional environments. The other two STs interviewed expressed the desire to have the availability of a computer projector, but did not mention how the media would assist in incorporating language during instruction. It is unknown why these two teachers did not use instructional methods for language acquisition and subject content.

Research studies have found that LEP instruction should be challenging, technologically appropriate, and reflective of best practices (Montecel & Cortez, 2002). The LEP students need systematic language development for gaining the academic

literacy skills needed to succeed in acquiring the content and to pass standardized assessments (Short & Echevarria, 2004). Even with effective instructional practices for LEP students, the initial achievement gap should close in about five or six years between LEP and their non-LEP peers (Thomas & Collier, 1997). The importance of STs using teaching methods to promote language acquisition and subject content cannot be ignored. These teachers need to use additional teaching methods beyond only slowing the pace of instruction if the achievement gap of LEP students is to close.

The STs may struggle with focusing on both language and content objectives during instruction.

Furthermore, teachers might not have a clear, high-level understanding of the LEP student's needs when going through the second language acquisition process. Two recommendations emerged after observing STs teaching methods and interviewing the teachers. First, a structured curriculum that all sheltered teachers use in mathematics classes is recommended to support of student educational needs related to language and mathematics. Second, further studies investigating the effective use and availability of instructional media to promote language acquisition and obtaining mathematical skills in sheltered classrooms are recommended.

Research Question 4

Data collected from the SS and NS interviews conducted in this study were used to address Research Question 4 that asked, “What are the students' attitudes of the mathematics classes in sheltered versus non-sheltered environments?” Themes from the classroom observations and interviews were different on a variety of levels. The language

difference between SSs and their teachers affected the differences found between the sheltered and nonsheltered learning environments. The structural description or essence of the lived experience of the participating students produced two factors influencing the attitudes of both study samples with regard to the classroom environment – (a) support; and (b) teaching methods.

Support

Both the SSs and NSs participating in this study focused their comments on the support provided in the classroom. The SSs depended upon the paraprofessional support for language related difficulties. Students in nonsheltered classes also commented on the support provided within the classroom; however their focus was on the support received from teachers. None of the SSs or NSs interviewed expressed seeking additional help that the school provided or said that they had attended any of the outside teacher or tutoring sessions provided. Yet, some of the students did voice various problems with their mathematics skills. Two SSs were frustrated with the word problems given on the FCATs mathematics section and did not feel prepared to complete that criteria. The NSs were more confident with their mathematics skills to complete the FCAT, but they felt unprepared when they started algebra.

The high school in this study provided after school tutoring with a mathematics teacher and the administration arranged transportation for students attending. The SSs were also provided with a paraprofessional and peer tutor that spoke Spanish during the tutoring sessions. The school environment was clearly supportive; however, the students

were not expending the effort to take advantage of the supplemental benefits extended to them. It seemed that the students did not understand or value the need to take advantage of the additional support provided by the school.

The Curriculum Compliance teacher for LEP students and mathematics department continually announced the after school tutoring to the students provided by the high school; however their efforts to motivate attendance was not successful. Both the SSs and NSs did not expend the time or self-discipline needed to improve their skills. Additional support for SSs is critical since these students are learning a new language and subject content simultaneously. Culturally driven factors such as parental support, friends, or even pressure in some cases also plays a role in influencing students' attitudes and perceptions of mathematics. Students in LEP classes have been exposed to different cultural and country backgrounds. It is unknown if other high schools providing after school mathematics tutoring for LEP students in sheltered mathematics classes have a greater attendance rate to these sessions.

Two recommendations emerged after observing the support provided in sheltered classes, interviewing the students, and researching the support provided by the school's mathematics and the department that oversees LEP students. First, more research investigating successful after school tutoring for high school LEP students is needed to compare and determine the motivational factors used to increase attendance to the tutoring sessions. Second, more studies are recommended to determine whether or not LEP students culture plays a role in their attitudes towards mathematics.

Teaching methods

The SSs and NSs comments varied about the teaching methods in their classes. Both Ss and NSs interviewed were satisfied with the textbook, handouts, or projected images used in the class. The only discontent among two SSs was their dissatisfaction with how the teacher prepared them for the FCAT. The NSs were pleased with the methods that the teachers used and felt that the teachers helped them understand the content with the exception of one NS who wanted the teacher to slow the instructional pace.

Teachers instructed students in English in both sheltered and nonsheltered classes. One main difference found between the SSs and NSs were the attitudes of the SSs receiving instruction in English. The SSs interviewed were positive about the teacher's instruction in English; however, one SS commented that students were taking advantage of the language differences. As SS-3 said, "Most of them [sheltered students] understand, but they are just acting stupid. They say that if they look like they do not understand they are going to do better. . . ."

The STs are required to speak English in the classroom and the paraprofessional is to assist when students have difficulty understanding instruction in English. The teaching method of speaking English in the classroom is supportive of the sheltered students English language acquisition; however, the SSs were using the language differences as an excuse for not learning from the instructional methods used by the teachers. This attitude of SSs taking advantage of the language difference could affect their mathematics achievement. Teachers cannot know what mathematical skills the

students are lacking if students are pretending not to understand the content taught regardless of the teaching methods used. Sheltered or LEP students are held to the same Florida Sunshine State Standards in mathematics as NSs. Pretending not to understand does not help the SS successfully complete the FCAT or districts year-end mathematics test.

Areas for Future Research

Structural descriptions of the data collected in this mixed-method study were developed to synthesis the meanings and essences of the phenomenon or experience (Moustakas, 1994). Two components that had the strongest association with a positive environment for LEP students and their teachers were found: 1) support, and 2) teaching methods. The following recommendations are made for future research.

1. Further studies are needed on LEP students of diverse language backgrounds in sheltered mathematics classrooms using the WIHIC to measure the learning environment.
2. Further studies comparing the attitudes of algebra and geometry students are needed to discover the factors that lead to geometry students favoring algebra.
3. More studies are recommended to investigate if the amount of mandated support is sufficient in high school mathematics classes given the growing number of LEP students entering high school.

4. More studies are recommended to investigate the use of a structured curriculum in sheltered mathematics classes to support the students' educational needs as related to language and mathematics.
5. Further studies investigating the effective use and availability of instructional media to promote language acquisition and mathematical skills in sheltered classrooms.
6. More research investigating successful after school tutoring for high school LEP students is recommended to compare and determine the motivational factors used to increase attendance.
7. More studies are recommended to determine whether or not LEP students' culture plays a role in their attitudes towards mathematics.
8. Perhaps findings from this study could be used to develop a quantitative instrument to measure the attitudes of sheltered teachers and students that is specific to the different experiences of these types of classes.

Conclusion

Student mathematics achievement is an ongoing problem with the lack of student mathematics skills in this country. The LEP teachers and students have additional struggles to face with having to teach and learn two things simultaneously: language and mathematics content. Furthermore, significant mathematics achievement gaps exist between LEP and non-LEP students with state and national assessments (Snow &

Biancarosa, 2003). The LEP students' mathematics scores on standardized tests tend to be lower than their non-LEP peers (Abedi et al., 2001). (Abedi et al., 2001).

This study sought to provide a coherent picture of the attitudes of sheltered students and their teachers in a high school mathematics class and to identify those components in mathematics classroom environments that have the strongest association with a positive learning environment for LEP students. A major purpose for measuring classroom environments is to determine the type of learning environment that is the most beneficial to all students (Moos, 1979b). Mathematics deficiencies raise the concern of what kinds of environments are needed to encourage students to gain knowledge, process, and evaluate their own increasing knowledge (English, 2002).

This study used a mixed method that combined quantitative and qualitative approaches using data from a survey instrument (WIHIC), observations, and teacher and students interviews. Interviews used a phenomenological approach that examined teachers and students' attitudes of the classroom environment. Accuracy of the different data findings was conducted using the triangulation strategy.

Results from the WIHIC used to measure attitudes of the learning environment between SSs and NSs suggest that this study might be specific to sheltered classes with primarily Hispanic students. Further studies between algebra and geometry student's attitudes of the learning environment using the WIHIC are needed to determine the factors of why geometry students perceive a more positive environment.

The structural descriptions from classroom observations and teacher and student interviews produced two factors influencing the attitudes of both study samples with

regard to the classroom environment – (a) support; and (b) teaching methods. Results suggest that sheltered teachers are frustrated with the additional challenge of student's language differences. These teachers felt that additional support (i.e., paraprofessionals) was needed in the classroom to meet the districts requirements, acquisition of mathematical skills, and students need to pass the FCAT. The amount of mandated support for high school STs and their students might need to be increased to help close the achievement gap between LEP students and their peers. Findings of the STs teaching methods varied with two of the teachers not incorporating language acquisition while teaching mathematics. Teaching methods used resulted in two recommendations. First further studies are needed to investigate if STs are using best practices to support both language acquisition and mathematical skills in sheltered classes. Second, further studies investigating the effective use and availability of instructional media to promote language acquisition and mathematical skills in sheltered classrooms are recommended.

Results from the SSs and NSs found that both groups were not putting forth the effort to take advantage of the additional mathematics support provided after school. Both the SSs and NSs did not expend the time or self-discipline needed to improve their skills. More research investigating successful after school tutoring for high school LEP students is recommended to compare and determine the motivational factors used to increase attendance. Finally, the main difference found between the teaching methods used in sheltered and nonsheltered classes was the attitude of the SSs receiving instruction in English. The SSs interviewed were positive about learning English; however, some SSs could take advantage of the language differences and not putting

forth the effort to acquire the mathematical skills needed. Cultural factors could play a role in influencing the LEP student's attitudes towards mathematics. Perhaps findings from this study could be used to develop a quantitative instrument to measure the attitudes of STs and their students that is specific to the different experiences of these types of classes.

APPENDIX A: IRB APPROVAL



Office of Research & Commercialization

January 17, 2007

Michelle Snider
P.O. Box 780602
Orlando, FL 32878

Dear Ms. Snider:

With reference to your protocol #06-4047 entitled, "Limited English Proficient (LEP) Students and Their Teachers' Attitudes of the Learning Environment in Mathematics Classes," I am enclosing for your records the approved, expedited document of the UCFIRB Form you had submitted to our office. **This study was approved on 01/6/2007. The expiration date for this study will be 01/15/2008.** Should there be a need to extend this study, a Continuing Review form must be submitted to the IRB Office for review by the Chairman or full IRB at least one month prior to the expiration date. This is the responsibility of the investigator.

Please be advised that this approval is given for one year. Should there be any addendums or administrative changes to the already approved protocol, they must also be submitted to the Board through use of the Addendum/Modification Request form. Changes should not be initiated until written IRB approval is received. Adverse events should be reported to the IRB as they occur.

Should you have any questions, please do not hesitate to call me at 407-823-2901.

Please accept our best wishes for the success of your endeavors.

Cordially,

A handwritten signature in cursive script that reads "Joanne Muratori".

Joanne Muratori
(FWA00000351 Exp. 5/13/07, IRB00001138)

Copies: IRB File
Glenda Gunter, Ph.D.

JM;jm

12201 Research Parkway • Suite 501 • Orlando, FL 32826-3246 • 407-823-3778 • Fax 407-823-3299

An Equal Opportunity and Affirmative Action Institution

APPENDIX B: CONSENT AND ASSENT FORMS

English Parental-Consent Form

 **REVISED**
11/26/07

Parental Informed Consent

February 20, 2007

Dear Parent/Guardian:

Your child has been nominated by his/her teacher to participate in a study that is being conducted for dissertation research in conjunction with the University of Central Florida, College of Education. Your child's identifying information has not been shared in any way with the researcher at this time. Your child was chosen because he/she meets the criteria for this study and you, as parent, are being offered the opportunity to have your child participate.

The research project involves a study of your child's attitudes of the mathematic classroom environment. The researcher wants to document and write about your child's attitudes and experiences. It is important to find out what helped to make a positive mathematics environment for your child. In addition, we want to determine any barriers that made the environment difficult. The results of this study may someday help educators develop a more positive environment for students. Your child will not receive any direct benefit.

With your consent, your child will complete a survey and will be interviewed by the primary researcher, a doctoral candidate at the University of Central Florida. The survey and interview will be held in a school office during instructional time and should take less than 30 minutes each. The interview will be tape recorded for transcription purposes only. Surveys and tapes will be stored in a locked cabinet at the home of the researcher and will be destroyed soon after the research process is complete.

Your child's name, the names of his/her teachers, and the name of your child's school will be kept confidential and will not be used in any report, analysis, or publication. All identifying information will be replaced with alternate names or codes. In addition, the researcher is requesting your permission to access your child's documents and school records such as those available in the cumulative file, his/her grades, and discipline information.

Your child will be allowed the right to refuse to answer any questions that make him/her uncomfortable, and he/she may stop participating in this research at any time. Your child will be reminded of this immediately prior to completing the survey and the interview. I have attached a copy of the survey and interview questions for your information.

You may contact me at 407-929-5966 or email at msnider@mail.ucf.edu or my professor, Dr. Glenda Gunter at 407-823-3502 or by email at ggunter@mail.ucf.edu for any questions you have regarding the research procedures. Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (IRB). Questions or concerns about research participants' rights may be directed to the UCF IRB office, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246, or by campus mail 32816-0150. The hours of

APPROVED BY
University of Central Florida
Institutional Review Board



REVISED
11/31/07

operation are 8:00 am until 5:00 pm, Monday through Friday except on University of Central Florida official holidays. The telephone numbers are (407) 823-2901 and (407) 882-2276.

Sincerely,

Michelle Snider

I have read the procedure described on the previous page.

I have received a copy of this form to keep for my records.

I have received a copy of the survey for my records.

I have received a copy of the interview questions for my records.

I voluntarily give my consent for my child, _____, to participate in Michelle Snider's study entitled, "Limited English Proficient (LEP) Students and Their Teachers' Attitudes of the Learning Environment in Mathematics Classes", to be interviewed, and complete the survey in the school's office during his/her non-instructional time.

_____/_____
Parent/Guardian Date

_____/_____
2nd Parent/Guardian Date

(or Witness if no 2nd Parent/Guardian)

Please sign and return one copy of this page.

APPROVED BY
University of Central Florida
Institutional Review Board

VICE CHAIRMAN

Spanish Parental-Consent Form



Informe de consentimiento para padres

February 20, 2007

Querido padre/ tutor:

Su hijo ha sido nominado por el maestro para participar en un estudio que ha sido conducido por disertación de investigación junto con University of Central Florida, College of Education. La información de identidad de su hijo, hasta el momento no ha sido compartida de ninguna forma con el investigador. Su hijo ha sido elegido porque cumple con el criterio para este estudio y usted como padre, se le ha ofrecido la oportunidad para hacer que su hijo participe.

El proyecto de investigación envuelve un estudio sobre el comportamiento de su hijo, en un salón de clases de matemáticas. El investigador quiere documentar y escribir sobre el comportamiento y experiencias de su hijo. Es importante encontrar lo que ayudo a obtener un ambiente de matemáticas positivo para su hijo. Además queremos determinar cualquier barrera que haga el ambiente más difícil. Los resultados de este estudio podrían ayudar algún día a los educadores a desarrollar un ambiente mas positivo para los estudiantes. Su hijo no recibirá ningún beneficio directo.

Con su consentimiento, su hijo completará una encuesta y será entrevistado por el investigador principal, un candidato doctorado de University of Central Florida. La encuesta y la entrevista serán sometidas en la oficina de la escuela durante el tiempo de clases y tomaría menos de 30 minutos cada una.

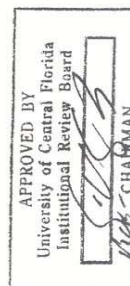
La entrevista será grabada en cinta solamente para propósitos de transcripción. Encuestas y cintas serán almacenadas en un gabinete asegurado en la casa del investigador y serán destruidas tan pronto la investigación se complete.

El nombre de su hijo/a, el nombre de sus maestros/as, y el nombre de la escuela de su hijo serán mantenidos confidencialmente y no serán usados en ningún reporte, análisis o publicación. Toda la información de identidad será remplazada con nombres alternos ó códigos. En adición el investigador requiere de su permiso para acceder los documentos de su hijo/a y los registros de la escuela tal como los que están disponibles en el archivo acumulativo, sus evaluaciones e información de su conducta.

Se le permitirá a su hijo el derecho no contestar a alguna pregunta que lo/la hagan sentir incomodo/a, y el/ella pueden dejar de participar en esta investigación en cualquier momento. Se le recordará a su hijo acerca de esto inmediatamente antes de empezar con la entrevista y la encuesta. He adjuntado una copia de la encuesta y de las preguntas de la entrevista para su información.

Puede contactarme al 407-929-5966, a mi correo electrónico msnider@mail.ucf.edu, con mi profesor, Dr. Glenda Gunter al 407-823-3502 ó vía correo electrónico al ggunter@mail.ucf.edu para cualquier pregunta que usted tenga acerca de los procedimientos de la investigación. Investigación de University of Central Florida envuelve participantes humanos que son realizados bajo el cuidado de Institutional Review Board (IRB).

Preguntas o inquietudes acerca de los derechos de los participantes serán dirigidos a la oficina de UCF IRB, University of Central Florida, Oficina de investigación y comercialización, 12201



A B
REVISED
1/3/07

Research Parkway, suite 501, Orlando, FL 32826-3246, ó por el buzón del campus 32816-0150.
Los horarios de operación son 8:00 AM hasta 5:00 PM. Lunes a Viernes excepto días feriados de
University of Central Florida. Los números de teléfono son (407) 823-2901 y (407) 882-2276

Sinceramente,

Michelle Zinder

___ He leído el procedimiento descrito en la página anterior.

___ He recibido una copia de esta forma para conservarla en mis expedientes.

___ He recibido una copia de la encuesta para mis expedientes.

___ He recibido una copia de las preguntas de la entrevista para mis expedientes.

Yo voluntariamente doy mi consentimiento para mi hijo/a _____,
para participar en el estudio de Michelle Snider titulado "Estudiantes con una limitada habilidad
en Ingles y la actitud de sus maestros en el ambiente de aprendizaje en las clases de matemáticas"
("Limited English Proficient (LEP) Students and Their Teachers' Attitudes of the Learning
Environment in Mathematics Classes").

Padre/ Tutor

Fecha

2do. Padre/ Tutor

Fecha

(ó Testigo si no 2do. Padre/Tutor)

Por favor firme y regrese una copia de esta pagina

APPROVED BY
University of Central Florida
Institutional Review Board

V. C. B. CHAIRMAN

English-Student Assent

ASSENT FORM

PROJECT: Limited English Proficient (LEP) Students and Their Teachers' Attitudes of the Learning Environment in Mathematics Classes

RESEARCHER: Michelle Snider

CONTACT: Michelle Snider or Dr. Glenda Gunter at 407-823-3502
University of Central Florida, Department of Educational Research and Leadership,
P.O. Box 161250, Orlando, FL 32816-1250

Please READ this explanation carefully, and ASK any QUESTIONS before signing.

You are being asked to participate in a research study. You will be asked to complete a survey about how you feel. Your responses will be kept completely confidential, which means that your name will be separated from your answers and will not be shared with anyone else. No one but me, Michelle Snider, and my professor will see your responses, so please try to answer honestly. The information will provide valuable knowledge about young people in general and your private, individual information will not be published. If you become uncomfortable at any time, please tell me immediately. Your participation in this project is completely voluntary, and YOU MAY STOP AT ANY TIME.

I volunteer to take part in this research study and know that I can quit any time I want to.

Signature of Student

Date

Printed Name of Student

Spanish-Student Assent

FORMA DE CONSENTIMIENTO

PROYECTO: “Estudiantes con una habilidad limitada en Ingles y la actitud de sus maestros en el ambiente de aprendizaje en las clases de matemáticas” (“Limited English Proficient (LEP) Students and Their Teachers’ Attitudes of the Learning Enviroment in Mathematics Classes”).

INVESTIGADOR: Michelle Snider

CONTACTO: Michelle Snider ó Dr. Glenda Gunter al 407-823-3502
University of Central Florida, Departamento Educacional de Investigación y liderazgo,
P.O Box 161250, Orlando, FL 32816-1250

Por Favor lea esta información detenidamente, y PREGUNTE cualquier DUDA antes de firmar.

Ha sido elegido para participar en un estudio de investigación. Se le pedirá que complete una encuesta acerca de cómo se siente. Sus respuestas serán mantenidas confidencialmente, lo cual significa que su nombre será separado de sus respuestas y no las compartiremos con nadie más. Nadie, excepto yo Michelle Snider, y mi profesor verán sus respuestas. Por favor trate de contestar honestamente. La información proveerá conocimientos muy valiosos acerca de jóvenes en general y su privacidad, información individual no será publicada. Si usted se siente incómodo en cualquier momento, por favor dígamelo inmediatamente. Su participación en este proyecto es completamente voluntaria, y USTED PUEDE SUSPENDER EN CUALQUIER MOMENTO.

Yo me ofrecí voluntariamente para tomar parte en este estudio de investigación y se que puedo retirarme en el momento que lo decida.

Firma del Estudiante

Fecha

APPENDIX C: WHAT IS HAPPENING IN THIS CLASS?

Original Instrument in English

What is Happening in this Class?

DIRECTIONS FOR STUDENTS: This questionnaire contains statements about practices that could take place in this class. You will be asked how often each practice takes place.

There are no ‘right’ or ‘wrong’ answers. Your name will not be used in any manner. Your opinion is what is wanted. Think about how well each statement describes what this class is actually like for you.

Be sure to give an answer for all questions. If you change your mind about an answer, just cross it out and circle another.

Some statements in this questionnaire are fairly similar to other statements. Don’t worry about this. Simply give your opinion about all statements.

Practice Example

Suppose you were given the statement “I choose my partners for group discussion.” You would need to decide whether you choose your partners ‘Very Often’, ‘Often’, ‘Sometimes’, ‘Seldom’ or ‘Almost Never’. If you selected ‘Often’ then you would circle the number 2 on your questionnaire.

Cohesiveness	Almost Never	Seldom	Sometimes	Often	Very Often
1. I make friendships among students in this class.	1	2	3	4	5
2. I know other students in this class.	1	2	3	4	5
3. I am friendly to members of this class.	1	2	3	4	5
4. Members of the class are my friends.	1	2	3	4	5
5. I work well with other class members.	1	2	3	4	5
6. I help other class members who are having trouble with their work.	1	2	3	4	5
7. Students in this class like me.	1	2	3	4	5

8. In this class, I get help from other students.	1	2	3	4	5
Teacher Support					
9. The teacher takes a personal interest in me.	1	2	3	4	5
10. The teacher goes out of his/her way to help me.	1	2	3	4	5
11. The teacher considers my feelings.	1	2	3	4	5
12. The teacher helps me when I have trouble with the work.	1	2	3	4	5
13. The teacher talks with me.	1	2	3	4	5
14. The teacher is interested in my problems.	1	2	3	4	5
15. The teacher moves about the class to talk with me.	1	2	3	4	5
16. The teacher's questions help me to understand.	1	2	3	4	5
Involvement					
17. I discuss ideas in class.	1	2	3	4	5
18. I give my opinions during class discussions.	1	2	3	4	5
19. The teacher asks me questions.	1	2	3	4	5
20. My ideas and suggestions are used during classroom discussions.	1	2	3	4	5
21. I ask the teacher questions.	1	2	3	4	5
22. I explain my ideas to other students.	1	2	3	4	5
23. Students discuss with me how to go about solving problems.	1	2	3	4	5
24. I am asked to explain how I solve problems.	1	2	3	4	5

Investigation					
25. I carry out investigations to test my ideas.	1	2	3	4	5
26. I am asked to think about the evidence for statements.	1	2	3	4	5
27. I carry out investigations to answer questions coming from discussions.	1	2	3	4	5
28. I explain the meaning of statements, diagrams, and graphs.	1	2	3	4	5
29. I carry out investigations to answer questions that puzzle me.	1	2	3	4	5
30. I carry out investigations to answer the teacher's questions.	1	2	3	4	5
31. I find out answers to questions by doing investigations.	1	2	3	4	5
32. I solve problems by using information obtained from my own investigations.	1	2	3	4	5
Task Orientation					
33. Getting a certain amount of work done is important to me.	1	2	3	4	5
34. I do as much as I set out to do.	1	2	3	4	5
35. I know the goals for this class.	1	2	3	4	5
36. I am ready to ready to start this class on time.	1	2	3	4	5
37. I know what I am trying to accomplish is this class.	1	2	3	4	5
38. I pay attention during this class.	1	2	3	4	5
39. I try to understand the work in this class.	1	2	3	4	5
40. I know how much work I have to do.	1	2	3	4	5
Cooperation					

41. I cooperate with other students when doing assignment work.	1	2	3	4	5
42. I share my books and resources with other students when doing assignments.	1	2	3	4	5
43. When I work in groups in this class, there is teamwork.	1	2	3	4	5
44. I work with other students on projects in this class.	1	2	3	4	5
45. I learn from other students in this class.	1	2	3	4	5
46. I work with other students in this class.	1	2	3	4	5
47. I cooperate with other students on class activities.	1	2	3	4	5
48. Students work with me to achieve class goals.	1	2	3	4	5
Equity					
49. The teacher gives as much attention to my questions as to other students' questions.	1	2	3	4	5
50. I get the same amount of help from the teacher as do other students.	1	2	3	4	5
51. I have the same amount of say in this class as other students.	1	2	3	4	5
52. I am treated the same as other students in this class.	1	2	3	4	5
53. I receive the same encouragement from the teacher as other students do.	1	2	3	4	5
54. I get the same opportunity to contribute to class discussions as other students.	1	2	3	4	5
55. My work receives as much praise as other students' work.	1	2	3	4	5
56. I get the same opportunity to answer questions as other students.	1	2	3	4	5

Permission Letters

Michelle Snider - RE: WIHIC permission

From: "Jill Aldridge" <J.Aldridge@curtin.edu.au>
To: "Michelle Snider" <msnider@mail.ucf.edu>
Date: 9/29/2006 2:27:16 AM
Subject: RE: WIHIC permission

Dear Michelle

You are welcome to use the WIHIC in your research. You will note that there are no reverse scored items in this instrument, reducing confusion.

I wish you well. Best wishes

Jill

From: Michelle Snider [mailto:msnider@mail.ucf.edu]
Sent: Thu 9/28/2006 1:40 AM
To: Jill Aldridge
Subject: WIHIC permission

Dear Dr. Aldridge,

I am a doctorate student at the University of Central Florida and would like to have permission to use in my research the "What is Happening in this Class?" (WIHIC) instrument as well as obtain any scoring protocols.

Thank you for your time,

Michelle Snider

From: "Barry Fraser" <B.Fraser@curtin.edu.au>
To: "Michelle Snider" <msnider@mail.ucf.edu>
Date: 8/13/2006 10:08:20 PM
Subject: RE: WIHIC and TOSRA- Permission

Michelle

You have my permission to use WIHIC and TOSRA.

In terms of providing further information about scoring, etc., you have not provided me with your mailing address.

Barry Fraser

From: Michelle Snider [mailto:msnider@mail.ucf.edu]
Sent: Mon 14/08/2006 6:17 AM
To: Barry Fraser
Subject: WIHIC and TOSRA- Permission

Dear Dr. Fraser,

I am a doctorate student at the University of Central Florida and would like to have permission to use the "What is Happening in this Class?" (WIHIC) and "Test of Science Related Attitudes" (TOSRA) instruments in my research as well as obtain the scoring protocols.

Thank you for your time,

Michelle Snider

Modified Instrument in English

What is Happening in this Class?

DIRECTIONS FOR STUDENTS: This questionnaire contains statements about practices that could take place in this class. You will be asked how often each practice takes place.

There are no 'right' or 'wrong' answers. Your name will not be used in any manner. Your opinion is what is wanted. Think about how well each statement describes what this class is actually like for you.

Be sure to give an answer for all questions. If you change your mind about an answer, just cross it out and circle another.

Some statements in this questionnaire are fairly similar to other statements. Don't worry about this. Simply give your opinion about all statements.

Practice Example

Suppose you were given the statement "I choose my partners for group discussion." You would need to decide whether you choose your partners 'Very Often', 'Often', 'Sometimes', 'Seldom' or 'Almost Never'. If you selected 'Often' then you would circle the number 2 on your questionnaire.

Cohesiveness	Almost Never	Seldom	Sometimes	Often	Very Often
1. In this class, I get help from other students.	1	2	3	4	5
2. I know other students in this class.	1	2	3	4	5
3. I am friendly to members of this class.	1	2	3	4	5
4. Members of the class are my friends.	1	2	3	4	5
5. I work well with other class members.	1	2	3	4	5
Teacher Support					

6. The teacher takes a personal interest in me.	1	2	3	4	5
7. The teacher helps me when I have trouble with the work.	1	2	3	4	5
8. The teacher is interested in my problems.	1	2	3	4	5
9. The teacher moves about the class to talk with me.	1	2	3	4	5
10. The teacher's questions help me to understand.	1	2	3	4	5
Involvement					
11. I give my opinions during class discussions.	1	2	3	4	5
12. The teacher asks me questions.	1	2	3	4	5
13. I ask the teacher questions.	1	2	3	4	5
14. Students discuss with me how to go about solving problems.	1	2	3	4	5
15. I am asked to explain how I solve problems.	1	2	3	4	5
Task Orientation					
16. Getting a certain amount of work done is important to me.	1	2	3	4	5
17. I know the goals for this class.	1	2	3	4	5
18. I pay attention during this class.	1	2	3	4	5
19. I try to understand the work in this class.	1	2	3	4	5
20. I know how much work I have to do.	1	2	3	4	5
Cooperation					
21. I share my books and resources with other students when doing assignments.	1	2	3	4	5

22. I work with other students on projects in this class.	1	2	3	4	5
23. I learn from other students in this class.	1	2	3	4	5
24. I work with other students in this class.	1	2	3	4	5
25. Students work with me to achieve class goals.	1	2	3	4	5
Equity					
26. The teacher gives as much attention to my questions as to other students' questions.	1	2	3	4	5
27. I am treated the same as other students in this class.	1	2	3	4	5
28. I receive the same encouragement from the teacher as other students do.	1	2	3	4	5
29. I get the same opportunity to contribute to class discussions as other students.	1	2	3	4	5
30. I get the same opportunity to answer questions as other students.	1	2	3	4	5

Instrument in Spanish

¿Qué esta pasando en esta clase?

INTRUCCIONES PARA ESTUDIANTES: este cuestionario contiene declaraciones acerca de prácticas que pudieran tomar lugar en esta clase. Se le preguntara que tan seguido estas prácticas toman lugar.

No hay respuestas “correctas” o “incorrectas”. Su nombre no se utilizara de ninguna manera. Su opinión es lo que cuenta. Piense bien en como cada declaración describe mejor lo que esta clase es para usted.

Asegurese de dar una respuesta para todas las preguntas. Si cambia de idea acerca de su respuesta, solo crúcela y circule otra.

Algunas de las declaraciones en este cuestionario son justamente parecidas a otras declaraciones. No se preocupe por eso. Simplemente de su opinión acerca de estas declaraciones.

Ejemplo de la práctica

Suponga que se le ha sido dada una declaración “Elijo a mis compañeros para discusión en grupo”. Necesitara decidir si elige ó no a sus compañeros “Muy frecuente”, “Frecuente”, “Algunas veces”, “Rara vez” ó “Casi nunca”. Si usted selecciona “Frecuente” entonces debe circular el número 2 en su cuestionario.

Acercamiento	Casi Nunca	Rara Vez	Algunas Veces	Frecuente	Muy Frecuente
1. En esta clase obtengo ayuda de otros estudiantes.	1	2	3	4	5
2. Conozco a otros estudiantes de esta clase.	1	2	3	4	5
3. Soy amigable con los miembros de esta clase.	1	2	3	4	5
4. Los miembros de la clase son mis amigos.	1	2	3	4	5
5. Trabajo bien con otros miembros de la clase.	1	2	3	4	5
Apoyo del maestro					
6. El maestro toma interés personal en mí.	1	2	3	4	5

7. El maestro me ayuda cuando tengo problemas con el trabajo.	1	2	3	4	5
8. El maestro esta interesado en mis problemas.	1	2	3	4	5
9. El maestro se acerca en la clase para hablar conmigo.	1	2	3	4	5
10. Las preguntas del maestro me ayudan a entender.	1	2	3	4	5
Participación					
11. Doy mis opiniones durante discusiones en clase.	1	2	3	4	5
12. El maestro me hace preguntas.	1	2	3	4	5
13. Hago preguntas al maestro.	1	2	3	4	5
14. Los estudiantes discuten conmigo de cómo hacer para resolver problemas.	1	2	3	4	5
15. Se me pide explicar como resuelvo problemas.	1	2	3	4	5
Orientación de Tareas					
16. Obtener cierta cantidad de trabajo hecho es importante para mí.	1	2	3	4	5
17. Conozco los objetivos de esta clase.	1	2	3	4	5
18. Pongo atención durante la clase.	1	2	3	4	5
19. Trato de entender el trabajo de esta clase.	1	2	3	4	5
20. Se que tanto trabajo tengo que hacer.	1	2	3	4	5
Colaboración					
21. Cuando hago tareas, comparto mis libros y recursos	1	2	3	4	5

con otros estudiantes.					
22. Trabajo con otros estudiantes en proyectos de esta clase.	1	2	3	4	5
23. Aprendo de otros estudiantes de esta clase	1	2	3	4	5
24. Trabajo con otros estudiantes en esta clase.	1	2	3	4	5
25. Estudiantes trabajan conmigo para lograr los objetivos de la clase.	1	2	3	4	5
Igualdad					
26. El maestro proporciona la misma atención a mis preguntas que la de otros estudiantes.	1	2	3	4	5
27. En esta clase soy tratado igual que otros estudiantes.	1	2	3	4	5
28. Recibo el mismo aliento del maestro que el de otros estudiantes.	1	2	3	4	5
29. Obtengo la misma oportunidad de contribuir en discusiones en clase que la de otros estudiantes.	1	2	3	4	5
30. Obtengo la misma oportunidad de responder preguntas que la de otros estudiantes.	1	2	3	4	5

APPENDIX D: STUDY-INTERVIEW PROTOCOLS

Student Interview

1. How do you feel about learning mathematics?
2. What do you feel about having to take the FCAT?
3. Can you think of any changes in the classroom that you would like to help you learn mathematics?

Teacher Interview

1. What do you feel are some of the limitations of teaching mathematics in your classroom environment?
2. What thoughts stand out for you, given no limitations, to make the preferred classroom environment?
3. What would you recommend to increase a supportive and positive classroom environment?

APPENDIX E: CLASSROOM-OBSERVATION SHEET

Classroom-Observation Sheet

Class:

Date:

Instructional Setting:

A. STUDENT COHESIVENESS:

B. STUDENT INVOLVEMENT:

C. ENVIRONMENT:

D. SUPPORT:

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