THE RELATIONSHIP BETWEEN CLASSROOM CLIMATE AND STUDENT ACHIEVEMENT

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The purpose of this study was to determine the relationship between sixth grade students' academic achievement levels in math and their perceptions of school climate. Student characteristics of socioeconomic status and gender were used to identify groups for the purpose of data analysis. Data was gathered using the five independent variables of the My Class Inventory (satisfaction, friction, competitiveness, difficulty, and cohesiveness) and the dependent variable of the Stanford Achievement Total Math scores. The results of the data collection were tested using a Pearson product-moment analysis and a backward multiple regression analysis. A univariate analysis of variance was also used to compare the five independent variables of the My Class Inventory as well as to compare socioeconomic status and gender with the Stanford Achievement Total Math scores. The schools selected for this study were from a city in Texas with a population of approximately 100,000. The sample consisted of 262 sixth grade mathematics students.

The findings of this study are as follows: (a) The Pearson product-moment correlation analysis revealed little, if any, correlation for any of the five subscale predictor variables; (b) the multiple regression analysis revealed that all five classroom climate indicators combined together could explain only 10.5% of the variance in mathematics achievement; (c) the univariate analysis of variance revealed that there is a significant relationship between the climate factors of friction and difficulty when compared to mathematics achievement; and (d) the univariate analysis of variance also

revealed that mathematics achievement scores vary significantly as a function of economic category membership, but there appears to be no relationship to gender.

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CHAPTER 1

RATIONALE, PURPOSE, AND PROBLEMS

Rationale

The Civil Rights Act of 1964 mandated the Commissioner of the United States Department of Health, Education, and Welfare to conduct a survey and make a report to the President and the Congress regarding the lack of availability of equal educational opportunities for individuals by reason of race, color, religion, or national origin in public educational institutions at all levels in the United States. The Commissioner, in turn, commissioned James E. Coleman of Johns Hopkins University to be responsible for the design, administration, and analysis of the survey. The resulting report, entitled Equality of Educational Opportunity, was commonly referred to as the "Coleman Report" (Coleman et al., 1966). This report suggested the family background of the student was the primary contributor to success, and the public school did not make a significant difference in that success. The report further suggested that students from poverty, lacking the prime conditions or values to support education, could not learn. Coleman's message was that the schools had little or no effect. Ronald Edmonds disagreed. He, along with Edmonds, et al. (1977) and Edmonds and Frederiksen (1979), refused to accept Coleman's report as conclusive, and they set out to find schools where students from low-income families were highly successful. Their intention was to demonstrate that schools could and do make a difference.

Edmonds' group of researchers investigated achievement data from schools in several major cities across the country whose students came from backgrounds of poverty. Though their findings contradicted Coleman's conclusions, they were left wondering why certain schools made a difference and others did not. They began comparing successful schools with similar schools where students were not learning or were learning at a low level (Association for Effective Schools, Inc.,1996).

One report by Edmonds, et al. (1977) documented the availability of equal educational opportunities for minority groups as compared with opportunities for Caucasian students. Both regional and national comparisons were made. Edmonds was particularly interested in the relationship between students' achievement levels and the kinds of schools they attended. One conclusion was that unique characteristics are common to schools where all students are learning, regardless of their background.

Learning Environment Theory

The concept of school effectiveness has been of significance since the 1970s. A commonly held conclusion of such studies was that the school a child attended did affect achievement. Effective school correlates were identified, and one of these correlates was a safe and orderly climate (Bolender, 1997). The concept of a learning environment has taken root since the 1930s. Lewin (as cited in Fraser, 1981) and Murray (as cited in Fraser, 1981) presented theoretical points of view recognizing both the environment and its interaction with personal characteristics of the individual as determinants of human behavior. Conceptualization of classroom climate was derived from a social psychology literature and was rooted in Murray's (1938) model, Getzels and Thelen's (1960) notion of classroom as a social system, and Walberg's (1971) model of classroom environments.

Demands, sanctions, and expectations within an environment (environmental press) gave a social system its own climate in Murray's model (as cited in Fraser, 1981). The learning environment was conceptualized as a complex of environmental press, thought to be related to a corresponding complex of personal needs. Murray introduced the term "alpha press" to describe the environment as assessed by a detached observer, and the term "beta press" to describe the environment as perceived by milieu inhabitants. According to Murray, personal needs referred to motivational personality characteristics representing tendencies to move in the direction of certain goals, while environmental press provided an external situational counterpart which supported or frustrated the expression of internalized personality needs other words, personal needs referred to motivational personality characteristics representing tendencies to move in the direction of certain goals, while environmental press provided an external situational counterpart which supported or frustrated the expression of internalized needs. Stern's (1970) Person-Environment Congruence Theory, based on Murray's model, proposed that more congruence between personal needs and environmental press lead to enhanced outcomes.

Also following Murray's model, Getzels and Thelen's (1960) model suggested that within school classes, personality needs, role expectations, and classroom climates interacted and predicted group behaviors, including learning. Climate developed as a result of the teacher's transactional style or the way in which role requirements and personality needs were balanced (Deng, 1992). The class was conceived as a social system with characteristic institutions, roles, and expectations for behavior. The class as a social system was related to the school as a social system, which in turn was related to the community as a social system, and so on. Ideally, the goal-behaviors of one social system were geared in to the goal-behaviors of the other related social systems. Within the class

itself, goal-behavior was achieved through the integration of institutions, the definition of roles, and the setting of expectations for the performance of relevant tasks. In performing the role-behaviors expected, the teacher taught; in performing the role-behaviors expected, the student learned (Getzels & Thelen, 1960).

In Walberg's (1971) model, environments were linked with students' aptitudes and the type of instruction in predicting learning outcomes. Walberg argued that most of the variance in student performance was attributed to the aptitude of learners and learning environments, with only a minor part accounted for by other variables. According to Nielsen and Kirk (1974), Murray's model (1938), Getzel and Thelen's model (1960), and Walberg's model (1971) have provided operational definitions of climate and have helped to generate theories about the relationships of climate to both antecedent and outcome variables. Through use of these theoretical models, classroom climate research has focused primarily on what is termed the "psychosocial environment" (Deng, 1992). Walberg (as cited in Deng, 1992) defined psychosocial environment as "the atmosphere of the class as a social group that potentially influences what students learn" (p. 4).

Climate

Both school effectiveness research and earlier quality of school life studies employed the concept of social climate to explain the student outcome-environment relationship. According to research (MacIntosh, 1991), effective schools appeared to have a critical mass of positive characteristics which, when found together, accounted for the differences in student achievement. The combined effect was more powerful than any individual factor, and the variables were subject to manipulation. The resulting institutional phenomenon was referred to as ethos or school climate. The notion of

climate stimulated renewed interest in the psycho-sociological dimensions of schools among a growing number of researchers interested in creating effective schools.

Kowalski and Reitzug (as cited in Dietrich & Bailey, 1996) took a more specific approach in the definition of climate. They defined climate as "a comprehensive structure made up of culture, physical plant, organizational structure, social relationships, and individual behaviors" (p. 16). This definition implied that climate was fluctuating rather than static, influenced by changes in outside forces as well as by the emotions of the staff and students. To create a positive climate, teachers had to be aware of changes and also had to be flexible in dealing with them (Dietrich & Bailey, 1996).

Over the past several decades, research has firmly established classroom learning environments as a thriving field of study (Deng, 1992; Edmonds & Frederiksen, 1979; Fraser, 1981; Walberg, 1979). Climate could positively influence the health of the learning environment, or it could significantly impede learning. Thus, feedback about climate could play an important role in reform (Freiberg, 1998). The benefits derived from information regarding climate and academic achievement could lead to identification of strategies that schools could take in designing effective interventions to produce improved academic performance in students. Considering the potential significance of information regarding classroom climate, attention should be given to its continued investigation. Examination of the relationship between classroom climate and academic achievement has proven to be vital, yet there has been very little current research in this area. Goodlad (1979) stated:

> [T]oo many researchers are preoccupied with research on single instructional variables that rarely account for more than 5% of the variance in student outcomes. Too few [researchers] study the complex phenomena of schooling in their natural environment, developing the needed new methodologies instead of seeking to adapt to the old. (p. 347)

Goodlad's words are still true today. Therefore, this study has been an attempt to examine the complex phenomena of the classroom environment and to reinforce research indicating a relationship between classroom climate and academic achievement.

Purpose, Problems, and Questions

The purpose of the study was to investigate specific factors that contribute to the establishment of a positive climate in the classroom and to determine the relationship between these classroom climate factors and mathematics achievement in sixth grade. In order to fulfill the purpose of the study, three problems with resulting questions were offered.

The first problem was to identify students' perceptions of classroom climate as they pertain to mathematics achievement. Arising from this problem was the question: What is the relationship between students' perceptions of the classroom climate and mathematics achievement?

Problem two was to identify students' perceptions of specific classroom climate factors and their relationships to mathematics achievement. Five questions were asked to address this problem: (a) What is the relationship between students' perceptions of cohesiveness and mathematics achievement? (b) What is the relationship between students' perceptions of friction and mathematics achievement? (c) What is the relationship between students' perceptions of satisfaction and mathematics achievement? (d) What is the relationship between students' perceptions of competitiveness and student achievement? and (e) What is the relationship between students' perceptions of difficulty and mathematics achievement?

The final problem was to identify students' socioeconomic status and its relationship to mathematics achievement. To answer this problem, the question was

asked: What is the relationship between students' socioeconomic status and mathematics achievement?

Research Hypotheses

The following null hypotheses were proposed for this study:

1. There is a no relationship between students' perceptions of the classroom climate and mathematics achievement.
2. There is no relationship between students' perceptions of cohesiveness and mathematics achievement.
3. There is no relationship between students' perceptions of friction and mathematics achievement.
4. There is no relationship between students' perceptions of satisfaction and mathematics achievement.
5. There is no relationship between students' perceptions of competitiveness and mathematics achievement.
6. There is no relationship between students' perceptions of difficulty and mathematics achievement.
7. There is no relationship between students' socioeconomic status and mathematics achievement.

Assumptions

1. It was assumed that the My Class Inventory was a way of determining a student's perception of his or her classroom climate.
2. It was assumed that the students' responses corresponded to the reality of perceptions of the classroom climate.

3. It was assumed that the students were honest in responding to the My Class Inventory, having been assured of their anonymity.

4. It was assumed that the students and parents responded honestly regarding socioeconomic status.

5. It was assumed that no major change in the students' perceptions of the class, as measured by the five scales of the My Class Inventory, had occurred between the administration of the Stanford Achievement Test and the administration of the My Class Inventory.

Benefits of the Study

The results of this study can only be generalized to this one particular school district. However, the results provide valuable information to educators involved in the study, as well as to the global education community. The findings also heighten teacher awareness of the importance of classroom climate.

Limitations of the Study

The ability to generalize this study is limited to students from a city similar to the one sampled in the study and may not be relevant to schools larger or smaller than those in the study, nor to populations which are more rural or urban than those in the study. The sample was voluntary, which could have resulted in a biased selection factor, and it was limited to sixth grade mathematics classrooms in a specific school district. Students in the sample were not necessarily representative of all sixth grade math students.

In addition, self-report instruments were subject to human error due to perceptions respondents may have had on a particular day. Students may or may not have accurately depicted a true perception of classroom climate.

Finally, there were no control factors that would account for prior student achievement. There was no pre or post testing of students to determine the appropriate levels of mathematics achievement. Correlational research failed to control for all other possible causes of variation in outcomes.

Definition of Terms

1. Alpha Press is the environment as assessed by a detached observer.
2. Academic achievement refers to students scoring at or above the minimum level of proficiency as defined by standardized tests.
3. Backwards solution is a regression model in which all predictor (independent) variables are initially entered into the model and then deleted if they do not make a contribution to the regression model (Hinkle, Wiersma, & Jurs, 1998).
4. Beta press is the environment as perceived by its inhabitants.
5. Case study is an in-depth study of a phenomenon in its natural setting.
6. Canonical is defined as authorized, recognized, or accepted.
7. Classroom climate is the perceived atmosphere, both positive and negative, resulting from the physical and social environment.
8. Classroom community is the sense of connection and belonging among the students and teacher.
9. Classroom management encompasses all the planned or spontaneous activities and interactions that occur within the classroom.
10. Cohesiveness refers to the extent to which students are friendly and helpful toward each other.
11. Communication is defined as the interchange of thoughts, opinions, or information.

12. Competitive goal structure refers to students competing with one another for achievement goals.

13. Competitiveness is the emphasis on students as rivals.

14. Cooperative goal structure refers to students perceiving that their personal achievement goals depend on how well other students achieve their personal goals.

15. Correlation coefficient is the mathematical representation of the direction and magnitude of the relationship between two measured variables (Gall, Borg, & Gall, 1996).

16. Correlational research identifies possible causes and effects of important educational phenomena, such as academic achievement (Gall et al., 1996).

17. A curriculum is a course of study.

18. Curvilinear consists of straight lines which do not fit a scatterplot and curved lines do fit the plot (Hinkle et al., 1998).

19. Dependent variables (criterion variables) are dependent on independent variables.

20. Difficulty is the extent to which students have trouble with the work in class.

21. Environment includes the physical, social, and intellectual conditions, forces, and external stimuli in a setting.

22. Effective school correlates are the indicators to be the most important predictors of school success.

23. Effort attribution is the result of trying or attempting.

24. Ethnography pertains to the scientific description of a culture.

25. Expectations are those things which are anticipated or hoped for.

26. Friction is the amount of tension among students and staff.

27. Heterogeneous means dissimilar or not of the same composition.

28. High inference measures are the subjective ratings of perceived behavior.

29. Homogeneous means to be of the same composition, alike, or similar.

30. Independent variables (predictor variables) are independent of the outcome but are believed to influence the outcome.

31. Interaction analysis is the process of observing and classifying events in a classroom.

32. Low inference measures are ratings involving specific teacher behaviors.

33. Multiple linear regression is a method for measuring the effects of several factors concurrently.

34. A one-way univariate analysis of variance (ANOVA) compares one independent variable with two or more levels. Changes in the dependent variable are presumed to be the result of changes in the independent variable (Hinkle et al., 1998).

35. A Pearson product-moment correlation is the average cross-product of the standard scores of two variables (Hinkle et al., 1998).

36. Post hoc multiple comparison tests determine which pairs or combinations of means are not equal after the researcher rejects a null hypothesis (Hinkle et al., 1998).

37. Psychosocial is relating to both psychological and social factors.

38. Psychosocial environment is the atmosphere of the class as a social group.

39. A qualitative study generates data by subjective judgment. Typical examples are research involving attitudes or opinions of human subjects which involve the judgment of an observer (Isaac & Michael, 1995).

40. A quantitative study assumes the features of the social environment constitute an objective reality that is relatively constant across time and settings. The dominant methodology is to describe and explain this reality by collecting numerical data on observable behaviors and to subject these data to statistical analysis (Gall et al., 1996).

41. Reliability is the extent to which other researchers would arrive at similar results if they studied the same case using exactly the same procedures as the first research. In classical test theory, reliability is the amount of measurement error in the scores yielded by a test (Gall et al., 1996).

42. Satisfaction is the extent to which one enjoys a class.

43. Simple linear regression refers to variations in the dependent variable which are attributed to changes in only a single independent variable (Schroeder, Sjoquist, & Stephan, 1986).

44. Stress is defined as mental, physical, or emotional strain or tension.

45. Threat is any indication or warning of possible danger.

46. Trust is the belief or confidence in and reliance on a person or thing.

47. Tukey/Kramer is a type of post hoc multiple-comparison test used when sample sizes are unequal (Gall et al., 1996).

48. Validity is the appropriateness and usefulness of specific inferences made from test scores (Gall et al., 1996).

CHAPTER 2

RELATED LITERATURE

Socioeconomic Status

The Coleman Report (Coleman et al., 1966) was a comprehensive assessment of school achievement throughout the United States. It encompassed approximately 600,000 students in 4,000 elementary and secondary schools in the country. One of its objectives was to document how much students learned as measured by performance on standardized achievement tests. Coleman's report revealed that as low socioeconomic status (SES) students proceeded through school, they continued to perform below the national average at all grade levels on all measures. He further estimated that the percentage of school influence on student achievement accounted for only 10% to 20% of the total variance.

Since Coleman's (1966) historic report, other researchers have attempted to determine the relationship between a student's SES and academic achievement. Kaspi (1973) examined a random sample of 700 subjects who participated in a longitudinal study of educational achievement in an Israeli school system. A multivariate analysis confirmed the achievement gap between the socioeconomic status and academic achievement to be significant among all grade levels involved. A univariate t-test, performed by a multivariate procedure, substantiated the achievement gap between SES groups to be quite significant.

Conway (1976) investigated the patterns of intellectual growth and achievement levels of students who experienced similar elementary school education but differed in

cultural group membership and socioeconomic status. The subjects of this study were 271 junior high students in the Lincoln, Nebraska, public schools who had been in continuous attendance in the school system during elementary school. The evidence in this study indicated that low SES students did not perform as well academically as high SES students. Furthermore, the study revealed that ascending socioeconomic levels were accompanied by gains in IQ for all students.

One study by Morgan, Hofstra, Black, and Skinner (1979) obtained and analyzed information on the characteristics of children entering school for the first time. A sample of 209 children from different areas was studied in Ontario, Canada, including rural, urban, inner city, and metropolitan areas. Information was gathered by means of questionnaires, interviews, classroom observations, and direct testing. Findings of this study revealed that the socioeconomic status and educational levels of both parents were significantly related to a child's educational progress.

A 1981 study by Shakiba-Nejad and Yellin examined the socioeconomic status, parent participation, teacher awareness, and academic achievement of 76 elementary school students. The students were selected from a population of 148 fourth, fifth, and sixth graders. The California Achievement Test was used to assess academic achievement. The data was analyzed using Point Biserial Correlation, Fisher's Exact Probability Test, and the two-way Chi-Square. A strong positive correlation was found between a student's SES and academic achievement. However, these researchers presented evidence that the low levels of achievement could also be explained by the fact that lower SES students also had poor attendance records.

In the summer of 1984, the Governor and State Superintendent of Public Instruction of the State of Wisconsin appointed a commission to study the public schools

in 22 districts in the Milwaukee area. The study included 60,000 students from 15 of the districts. Data was obtained in the form of survey questionnaires, interviews, case studies, and telephone interviews. This data was compared to the socioeconomic status and academic performance of students. The analysis revealed that more than half of the variance in academic achievement could be explainable by SES, and that the relationship between achievement and SES was curvilinear (Walsh, 1986).

The purpose of a 1996 study by Alspaugh was to estimate the size of the achievement gap and its longitudinal effects upon cohort groups of high and low socioeconomic students as they progressed from grades two through six. Data was obtained from a Midwest urban school district with 40 elementary schools. Reading and math achievement scores were taken from the Missouri Mastery and Achievement Test (MMAT). Within the set of SES measures, the percentage of students on free or reduced lunch showed the largest negative correlation with student achievement. The correlation between reading achievement and SES indicators were consistently higher than the correlation for achievement in mathematics. A multiple regression analysis of the SES measures with reading achievement yielded a correlation of 0.84. Likewise, the multiple R for mathematics was 0.79. The coefficients of determination from the regression analysis indicated that socioeconomic status accounted for 62% to 71% of the variance, depending on the grade level.

Most recently, Marcon (1999) studied 222 urban early adolescents with a median age of 149 months. She examined differences in motivation that might affect academic achievement and perceptions of competence. Socioeconomic status was found to be an important factor in academic performance, noting that lower income students had poorer academic performance. Economically advantaged students had a significantly higher

grade point average and higher grades in all subjects except art, health, and physical education. Furthermore, higher Comprehensive Test of Basic Skills (CTBS) scores were found for higher SES students in overall battery and all subareas except spelling.

Testing

Testing was first introduced in China in 210 B.C., and assessments have since been based on the same basic technology (Madaus & O'Dwyer, 1999). The performance on a sample has been used to make references about a person's probable performance relative to the entire domain. Based on the inference, the researcher has been able to classify, describe, or make decisions about the individual. The dawning of the modern period in testing began near the end of the 19th century. The movement was brought to fruition in 1905 by Alfred Binet's introduction of the first successful intelligence test. The advent of the psychological testing movement changed testing forever, eventually to include the use of statistical criteria to select questions for inclusion on achievement tests. A major step in testing came in 1914 when multiple-choice item tests were introduced, and the use of efficient essay exams gained in popularity. It was this multiple-choice option that greatly facilitated the development of the ubiquitous national norm-referenced standardized commercial tests. One particular technological development in the modern era made multiple-choice tests even more efficient and cost effective. This was the 1995 invention by Everet Lindquist of a high-speed optical scanner. Compared to essay exams, multiple-choice tests were now scored in a fraction of the time and at a fraction of the cost. Objectivity and reliability were also increased, and the use of testing as a political, administrative, and accountability technique become especially popular.

Few issues in U.S. education have been considered more controversial than testing. Some have viewed testing as the precursor of serious reform and school

improvement. Others have viewed it as a menace to quality teaching and learning, but the public's view has been made clear. Most Americans have indicated that they favor student testing for purposes of information, accountability, and incentives. Critics of testing have been relentless, and many educators and testing experts have objected to the use of standardized testing. They have considered testing as a practice that is counter productive – one that distorts the curriculum, discourages higher-order thinking skills, and depresses student achievement (Phelps, 1999).

In addition to the development of norm-referenced achievement tests, psychologist and researchers have sought ways to develop measures of the perception of the environment. Moos (1973) indicated six major methods by which characteristics of environments have been related to indexes of human functioning. These included (a) ecological dimensions, which encompass geographical, meteorological, and architectural design variables; (b) behavior settings; (c) dimensions of organizational structure; (d) dimensions identifying the collective personal and/or behavioral characteristics of the milieu inhabitants; (e) dimensions related to psychosocial characteristics and organizational climates; and (f) variables relevant to the functional or reinforcement analyses of environments. These six categories were considered to be nonexclusive, overlapping, and mutually interrelated.

Education has been considered to be an applied science, and variables have been studied to learn whether or how they should be manipulated to enhance productivity. There have been two positions offered regarding variables characterizing learning environments. On the one hand, a positive learning environment has been viewed as a means to an end. On the other hand, a positive learning environment has been viewed as an end in itself. These two views have led to distinct approaches to learning environment

measures in educational research. If the environment was seen as an outcome, its measures appeared in the role of the dependent variables. If environment was seen as a means to the end, its measures were employed in correlational studies, often in order to predict achievement. Research on learning environments has spanned a wide range of settings within and beyond the classroom, and this type of research has addressed a variety of issues. Learning environment assessments have become convenient, practical, and inexpensive. They have demonstrated predictive validity and reliability, and research information from them proves interesting, meaningful, and suggestive to educational policy-makers and practitioners. As a result, learning environment assessments have been used in a wide variety of evaluation and research projects in many countries (Walberg & Haertel, 1980).

Climate

Comparing schools to determine the factors that make one school more effective than another has been a staple of educational research since Rice's (1893/1966) pioneering work at the turn of the century. Rice concluded, rather reluctantly, that testing was the best way to compare schools, and researchers have been using test results to compare schools ever since. In addition to comparing socioeconomic status of students with academic achievement, researchers have also compared classroom climate indicators with academic achievement. This comparison has been particularly difficult because of the very nature of climate.

School climate has been ever changing. The elements of climate have been complex, ranging from the quality of interactions to the physical comfort levels of the individuals. No single factor has determined climate; however, the interaction of various factors have created a fabric of support that may have affected learning at optimum

levels. Making even small changes in the classroom has been thought to lead to significant improvements in climate (Bolender, 1997), but determining the specific changes impacting climate and resulting in improved student achievement has been difficult to determine.

Stress

When promoting positive classroom environments, educators have needed to be aware of the impact of stress upon students. Excessive stress has been considered to be one of the greatest contributors to impaired academic learning, and teachers have needed to understand the many potential threats for students and the brain's response to stress (Jensen, 1998).

The anthropological literature has identified several of the major threats to human survival: starvation, disease, and human predation. A well-developed brain has been shown to provide an advantage in responding to those threats. Education has been considered an elaborate, adaptive mechanism to save students from the three threats restricting the ability to survive. While these threats to human survival may have appeared archaic, they have been considered root issues underlying the process of learning (Embry, 1997).

Threats have long served as weapons to regulate human behavior. When school attendance was not mandatory, threats were less relevant; a student who was upset could simply leave. In the year 2000, however, students have had to endure threats because law has mandated school attendance.

According to Jensen (1998), when students have felt threatened or become stressed, their bodies have responded through physical reactions, including depression of the immune system, tensing of the large muscles, blood clotting, and increasing blood

pressure. This type of reaction has lead to problems in school. Chronic stress has been shown to impair a student's ability to determine what is or is not important. Gazzaniga (1988) and Jacobs and Nadel (1985) suggested that the brain's short-term memory and ability to form long-term memories have been inhibited by stress. Students under stress have also been more susceptible to illness, which has helped to explain a vicious academic cycle. More academic stress has meant more sickness, which has meant poor health and missed classes. This has resulted in lower academic achievement (Jensen, 1998).

A typical day at school may have been filled with expectations and disappointments. Projects may not have worked out, grades may have been lower than expected, and classmates may not have respond as predicted. All of these irritations have been sources of stress, and the brain has reacted to these as threats. Students have perceived and responded to potential threats in different ways. Some may have dismissed them, while others may have consider them as a challenge and risen to the occasion. Unfortunately for others, threats may have been devastating. Students who have had early and repeated exposure to threats and high stress, particularly those who have come from families of violence, may have had problems with focusing their attention. Vision may have shifted constantly as they scanned the room for potential predators. Their brain's receptor sites may have adapted to a survival mode. These behaviors may have resulted in frustrated teachers, but such behaviors have made perfect sense to the student whose life has depended upon them (Jensen, 1998).

The list of perceived threats for students has been endless. Threats may have included situations such as family violence, loss of privileges at home or at school, a boyfriend or girlfriend who threatened to break up, or a school bully. A rude classmate or

a teacher who humiliated or embarrassed a student in front of peers may have been perceived as a threat (Jensen, 1998). Even seemingly minor things, such as negative comments, sarcasm, criticism, and put-downs, have been shown to increase abnormalities in heart rates (Atkins, 1999). Threats, resulting in stress, has put the brain on alert, which has activated defense mechanisms increasing survival but interfering with learning (Jensen, 1998). On the other hand, when environments have been positive and joyful, the body has released endorphins elevating good feelings. Learners have been more likely to experience better learning, memory, and feelings of self-esteem (Atkins, 1999).

The brain has reacted to stress and threats emotionally. Such emotions have influenced attention, event interpretation, motivation, prediction, recall, decision making, problem solving, and learning. Classroom teachers who have understood the impact of stress and have attempted to eliminate it from the classroom have helped to promote a more positive environment for learning (Atkins, 1999).

Communication

Classroom dynamics have encompassed a broad array of group processes and interactions that have affected the nature and amount of learning. Components have included how members of the class communicate, members' expectations of each other, the degree to which members have liked and respected one another, and grouping practices. These components have affected such learning outcomes as attitudes, achievement, self-concept, and social perspective taking (Paradise, 1994). One way to examine patterns of interaction has been to focus on communication, on which all levels of education have depended. The importance of communication in creating a positive classroom climate has not been over emphasized. In addition to verbal communication, other factors of communication such as facial expressions, gestures, and bodily posture

have been important. Nonverbal messages have often been inconsistent with verbal content, and these inconsistencies have been expressed continually in the classroom. Facial expressions have communicated such basic emotions as happiness, anger, disgust, sadness, and fear (Holden, 1994). Across cultures people have identified the signs of these basic emotions. Individuals have differed in facial expressiveness and the ability to interpret facial expressions, but females have shown a slight and consistent edge over males. Facial expressions have played an important role in relationships, because they have provided accurate information to others about the occurrence of pleasant and unpleasant emotional states. Holden reported that students learned more from teachers who showed positive rather than negative emotional expressions.

Communication has helped to build relationships, and the extent to which students have liked and respected one another has been shown to impact the level of academic performance. Students who have been accepted by their peers and liked them in return, have felt better about being in the classroom. Most friendships have begun because of proximity and appearance. Students who have sat close to one another have become friends, as have students who have seen attractive physical characteristics in one another. Communication has developed among these students and relationships have begun. Interpersonal attraction among students has been most positive when patterns of friendship have been diverse. Teachers have been most effective when students have been encouraged and rewarded for developing many friendships in class (Paradise, 1994).

Grouping practices, such as the physical setting of the classroom and in particular seating arrangements, have impacted communication. A circle pattern has resulted in the greatest amount of classroom participation, and students directly facing the instructor have participated more than those to the side of the instructor. When the arrangement has

been in rows, students on the periphery have tended to participate less, resulting in a lack of involvement and satisfaction. Arrangements based on ability levels have also affected communication. If students were grouped by achievement level, the contact between high and low-achievement students was lessened. The division has encouraged status differences and made it more difficult to have trusting, open, and honest communication (Paradise, 1994).

Teacher Impact

Of all the factors that have contributed to the social environment in which students are educated, the teacher has been the most decisive (Smith, Neisworth, & Greer, 1978). The teacher's attitude toward students and education has determined to a very real degree how students have perceived school, themselves, and one another. Teachers have made learning pleasant or punishing; they have created motivation or fear; they have produced excited anticipation or dread. A teacher's personal style and approach, more than anything else, has created the climate and mood characterizing the classroom. In this classroom, where the interaction between teacher and students is so complex, personal biases and emotions have often overshadowed the subtle variables that affect all levels of human interaction. Teachers may have been quick to assume that a child's inappropriate behavior was the result of problems at home or due to immaturity. Teachers have needed to realize that these behaviors may have been, at least partially, a consequence of the actions of the teacher. If students have experienced the classroom as a caring, supportive place where everyone is valued and respected, they have tended to participate more in learning (Lumsden, 1994). The teacher has played an instrumental role in providing a safe and orderly climate – a climate in which stress has been reduced and relationships have been nurtured.

According to recent teacher-role appraisals, the teacher was the organizer of optimum learning situations. The teacher determined the classroom climate depending on that teacher's decisions, style, practices, and interaction with students. Moos (1979) suggested that the teacher was of greater importance than the characteristics of the students in creating the classroom climate. Teachers who were committed to students were likely to spend the extra time and effort necessary to motivate and nurture their students. Committed teachers were likely to stay after school to tutor or counsel students, and they were willing to give of themselves on behalf of their students (Hoy & Hannum, 1997).

School has been more than programming and pedagogy, and the best curriculum in the world has had no effect in the hands of teachers who did not believe in, respect, and relate to their students. The foundation of any learning experience has resided in the nature of teacher-student relationships and the quality of the classroom climate. Although all teachers have acknowledged the importance of such relationships, some have not made the effort. In an attempt to make it through the curriculum, they have sacrificed relationships in order to cover the content (McCombs & Whisler, 1997). An elementary teacher has often had over 500 exchanges with individual students in a single day, and teachers have publicly evaluated pupil conduct with either praise or reprimands on the average of 15.89 times per hour, or 87 times a day (Doyle, 1986). In most cases teachers have had little leisure time to reflect before they reacted. Therefore, teachers have been wise to plan actions and activities that promote positive attitudes and perceptions, resulting in quality relationships and a positive climate. Greeting students, interacting with them about things outside of class, and caring for and treating them as human beings have been the kinds of things that learner-centered teachers have done. These same teachers have also monitored their own attitudes about their students, especially the more

difficult students. Teachers have even interacted with difficult students as if the students were the opposite of what they seemed (i.e., not difficult students). These teachers have also attempted to connect with each student, and they have been better able to respond to their students' unique capabilities and needs. They have been sensitive to cultural issues, as well as to different learning styles, values, perspectives, roles, and customs. They have come to know their students and their backgrounds and have incorporated a variety of ways for students to learn and ways to demonstrate or express that learning (McCombs & Whisler, 1997).

Classroom Management

One major aspect of the classroom climate that has fallen under the control of the teacher is that of classroom management and discipline. Classroom management has referred to all the planned or spontaneous activities and interactions that have occurred within a classroom. In recent years, a growing interest has emerged in the area of classroom management. Approaches have drawn primarily on principles of learning theory and behavior modification. Contingency management techniques and the judicious use of rewards and incentives have been used to stimulate interest and motivate the students (Wickens, 1994), but overuse of rewards and punishments has kept students externally rather than internally focused (Anderman et al.,1993). Anderman has also suggested that the use of rewards or prizes for participation, performance, or achievement may have improved students' perceptions of classroom climate. An effective teacher has long understood that the middle road to motivating students to manage their own behavior keeps rewards and punishments as subtle and informative feedback mechanisms, rather than controlling and coercion. Research has suggested that when students have reported a classroom as having a caring environment, students also

reported greater liking for school, concern for others, more sophisticated conflict resolution skill, less feelings of loneliness, and fewer discipline problems (Meece & McColskey, 1997).

Some teachers have taken a proactive approach to discipline and management, but certain prevention structures and routines have tended to increase threats and hostility. Some solutions to aggressive behaviors, in fact, increased their frequency. For example, many schools have hired people to become monitors on the playground and hallways. The basic job description for these monitors has been to notice improper behavior. This type of prevention has increased the focus and attention on improper behavior and has actually increased the frequency of such undesirable behavior. In a similar vein, emphasis on competitive games during recess has actually increased aggressive behavior, whereas structured, cooperative games have decreased aggression. Reliance on negative phone calls and negative notes to parents has tended to increase abusive behavior of high-risk families as well as aggressive behavior of the child toward the school – precisely the opposite of the intended effect (Embry, 1997).

Common intervention strategies have also fostered negative behavior. For example, some school staff members referred students to the principal or counselor for almost any disruption. Such referrals operated as a positive reinforcer or as an escape from a negative situation, in which case the child may have continued to engage in disruptions that resulted in ongoing referrals. Likewise, time-out may have been used for punishment, but what may not have been apparent to the teacher is that time-out was an effective way of escaping a situation that was aversive, such as experiencing frequent reprimands for poor academic work (Embry, 1997).

The sociological studies of Rutter (as cited in Embry, 1997) showed that schools have been able to reduce juvenile delinquency and other indices of developmental psychopathology. For example, Rutter found that praise for good work or behavior at assemblies led to improvement in student behavior. Increased decorations in the classroom and hallways promoted better behavior. Improved behavior and work occurred when greater proportions of students had the opportunity to hold positions of responsibility. Frequent homework was associated with good behavior and achievement. Widely publicized and implemented standards of behavior were effective in maintaining a positive school climate. Finally, high rates of interaction between students and teachers regarding academics also fostered positive behavior and achievement (Embry, 1997).

One constructive piece of advice for dealing with human relations in the classroom came from William Glasser (1965) who advised teachers to pay personal attention to difficult students when they were not in trouble. Getting to know students as individuals may have appeared to be time-consuming, but it has paid off in the long run (Gunter, Estes, & Schwab, 1990).

Teachers have also enhanced the orderly environment of the classroom through their skills in instruction and classroom management. The use of time has been important. Teachers who maximized their allocated time by beginning lessons promptly have had fewer discipline problems. Teachers who gave homework and provided rewards or reinforcement for actual achievement have also had fewer discipline problems. Effective teachers have modeled appropriate behavior. In classrooms with few behavior problems, teachers have used consequences but have avoided humiliation and violence toward students. Positive rewards and praise have generally outnumbered negative reinforcements (Squires, Huitt, & Segars, n.d.).

The implicit and explicit system of rules and organization has also been found to relate to student achievement. Moos (1979) reported that primary grade students made the greatest gains in reading and mathematics in classes that were perceived as systematic and orderly. Similarly, gains in learning were found by Haertel, Walberg, and Haertel (1981) to be negatively associated with disorganization, speed, and diversity.

Expectations

Since the 1968 landmark study by Rosenthal and Jacobson, Pygmalion in the Classroom, hundreds of studies have examined the idea that teachers' expectations affect the way they treat students, which affects what students learn. Expectations have affected the way people behave, and the way people behave has affected how others respond. Teachers have formed expectations based on information received from test scores, siblings' performances, behavior of the student, gender, social class background, teacher comments, and other sources. These expectations have been communicated by interacting differentially with students, depending on the expectation level. Differential behaviors have been evident in areas such as seating arrangements, the amount of time the teacher waits for a response from students, attention, amounts of praise, criticism, feedback, the type of questions asked, and demands made upon students.

Contextual factors, such as class size and variance in student achievement levels, have also affected teacher expectations. Teachers in larger classes have used expectations as a clue to behavior, because it has been so difficult to get to know students individually. Teachers have often depended on stereotypes in guiding their behaviors. Similarly, teachers have frequently developed expectations for diverse student groups to more easily shift expectation levels from one group to another (Paradise, 1994).

Student motivation to learn has been greatly affected by the expectations of teachers, because these expectations have functioned as self-fulfilling prophecies. In general, high expectation students have received more opportunities for learning and more corrective feedback and attention from teachers (Meece & McColskey, 1997). Brophy (1987) offered examples of differences found between teachers with low and high expectations for students. In cases where students were viewed with high expectations by their teachers, the teachers (a) were friendlier with the students, (b) gave more difficult and varied assignments, (c) called on these students more often, (d) provided more clues or rephrased questions more often, (e) waited longer for responses, (f) gave more detailed and accurate feedback, (g) praised these students more frequently for correct responses, (h) gave these students special privileges, and (i) allowed these students to suggest activities. For students who were viewed by their teacher with lower expectations, the teachers (a) criticized these students more often, (b) praised these students for marginal or incorrect responses, (c) made fewer personal contacts with these students, (d) watched low achievers more closely, and (e) asked other students to help low achievers.

Instruction

Another important aspect of classroom climate has dealt with instruction. Lecturing has had a place, but students have been found to attend more with opportunities for discussion, conversation, asking questions, joking, and hands-on experiences (Ponticell, 1997). The use of individualized instruction, such as seatwork, was related to lower levels of perceived classroom climate (Anderman et al., 1993). Problem-solving and self-learning were more engaging. Teachers have needed to use a variety of teaching strategies with an emphasis on support and success. Instruction has needed to include

flexibility and spontaneity, as well as responding to and building on students' energies and intentions. Humor and fun have also been needed in the classroom. Students have needed teachers with good attitudes who smiled a lot, chatted with students, and who valued a good honest laugh (Ponticell, 1997). Tasks needed to be challenging, yet achievable. Relevance was also important in helping students to understand how skills could be applied in the real world (Lumsden, 1994). Students needed a stimulating pace. Curriculum needed to be student-centered, and instructions needed to be brisk and engaging. If a concept was missed, the teacher needed to approach it again, but from a different, equally interesting perspective. Students needed to be actively involved in instruction as much as possible, and they needed to be encouraged to pursue their own personal interests beyond the classroom (Wilmore, 1992).

Feedback and rewards provided impetus for promoting a positive classroom climate. Sweeney (1992) found that even champions required feedback, and feedback needed to be specific and frequent. Even when providing feedback that was not positive, it was advisable to keep the voice light and to keep a smile on the face. Positive feedback such as achievement newsletters, academic trophy cases, and multiple and varied award programs helped to develop and perpetuate key beliefs and a winning attitude.

If instruction failed to engage and challenge students, classroom climate and intellectual development has suffered. Teachers have spent a great deal of time demanding attentiveness or simply trying to maintain order. Teacher burnout and student disciplinary/attendance problems have been likely. For this reason, the teacher has needed to be certain that the curriculum was designed in such a way that it would be of interest to the students, since students were more likely to learn material that they found stimulating (Rossi, 1999).

Trust

One of the key beliefs in creating a nurturing and caring classroom climate has been that of trust. Trust has been the glue that held the class together. In the emotion-laden environment of the school, trust has been the prerequisite to any kind of positive action. Trust has revolved around the belief that people would interact in a fair and honest manner; that they would maintain confidentiality; that they would be fair and consistent in how they dealt with people; and that they would be honest, capable, and supportive (Sweeney, 1992).

The classroom of the 21st century student has become more diverse, and teachers have had to view and interact with these diverse students as people, not problems. They have had to personalize and individualize the curriculum and environment as much as possible, just as a parent would. Cooperation and collaboration have been valued, and competition has been de-emphasized. Many students have shared in creating classroom communities where everyone is committed to helping everyone else learn and feel valued for his or her own special qualities. Recognition has often been utilized more than rewards, prizes, or high grades. Recognition has frequently come in the form of a note from a teacher or the opportunity to present student work to real audiences in the classroom, school, and community. Many students have felt valued when asked for their opinions. Because the classroom environment has often fostered personal growth, academic learning, and trust. It has enriched the lives of many students, and it may have given those students who have had the least support outside school their only chance at a bright future (Dodd, 1997).

Cohesiveness

As early as 1962, Maslow posited a psychological hierarchy in which the need for belonging took precedence over needs for knowledge and understanding. According to Slavin (1981), students who worked together liked school more than students who were not allowed to do so. They were more likely to say that they wanted their classmates to do well in school and that they felt their classmates also wanted them to do well. By participating in social-climate setting activities, both students and teachers came to better understand each other's value systems and began to create a cohesive environment. This enabled them to work together toward the common goal of social and academic achievement (Moos & Moos, 1973). Cohesion within the classroom was of great importance and was another aspect that needed to be examined before a positive social climate could be established (Vacha, 1977). Shapiro (1993) described cohesion as "the sum of group members' feelings about their group as a whole" (p. 95). In cohesive classrooms students valued their classmates, were involved with and cared about each other, tried to help one another, and were proud of their membership in the group (Vacha, 1977). They wanted to be competent doers and producers, and wanted to be known by others for their accomplishments. Educators who recognized that it was normal for students to yearn for success and recognition created learning experiences that helped to establish equilibrium and ensured success for all students (George, Stevenson, Thomason, & Beane, 1992). If a classroom developed norms that supported academic achievement, high cohesiveness enhanced education by providing a strong "we" feeling, which promoted conformity to the norms of the class. A cohesive classroom was one in which a wide variety of individual interests and needs were satisfied. A positive climate

supported diversity, differences, and likenesses, and it provided social support and encouragement of participation by all members (Shapiro, 1993).

Anderson (1970) studied a group of 800 students selected at random from 113 classes distributed throughout 27 states and Canada. The Learning Environment Inventory (LEI) was used to determine perceptions of climate. Scores were compared with four criterion instruments, including the Physics Achievement Test, the Test on Understanding Science, the Welch Science Process Inventory, and the Pupil Activity Inventory. A step-wise multiple regression analysis was used. Anderson found that significant relationships occurred between climate dimensions such as class cohesiveness, cliqueness and friction, and learning outcomes. Group cohesiveness was found to affect individuals differentially by sex and mental ability. Anderson's findings suggested classroom social climates have significant affects on individual learning, and wide differences exist based on student ability and sex.

Lott and Lott (1966) examined four elementary schools. Three were predominantly white, and one had a population of entirely African-American students. A total of 206 students participated in the study, 97 boys and 109 girls. The students were selected on the basis of sociometric and IQ score considerations. Their regular teacher gave members of the eight participating classes a sociometric test. This consisted of a Friendship Book in which each child was asked to rate all other same-sex students in the class. High-cohesive and low-cohesive same-sex groups of three or four students were formed on the basis of similar mutual ratings. In addition to the sociometric ratings, IQ scores were also taken into account in placing students into groups. The California Short-Form Test of Mental Maturity (CTMM) was used to determine IQ. An analysis of variance was utilized. The results on all the learning tests indicated that the high-IQ

students who were in high-cohesive groups did better than high-IQ students who were in low-cohesive groups. For low-IQ students, however, cohesiveness made no difference. The study also suggested that group intimacy affected girls more than boys, and that cohesiveness increased learning for the highly intelligent and decreased learning for the less intelligent. Other researchers were also interested in cohesiveness. Moos (1974) found that achievement in high school mathematics was related to high levels of class cohesion. In another study by Anderson and Walberg (1974), cohesiveness was found to be positively associated with student learning.

In order to create a positive classroom climate, teachers needed to provide students with cohesiveness through a sense of classroom community – a classroom with a sense of connection, a feeling that they were valued, and a feeling that they had influence with their classmates and teacher. Students with a strong sense of community felt personally known and respected. They believed that they had a voice in decision making and problem solving, and they believed that their fellow students cared about them and cared about learning (Schaps, Lewis, & Watson, 1997).

A strong sense of classroom community contributed to positive student outcomes. Students who experienced it simply did better than those who did not, and teachers who were successful at creating classroom communities were better at helping their students to grow ethically, socially, and academically. In a 1995 study by Battistich, Solomon, Watson, and Schaps students' sense of the school as a community was assessed with a 38-item scale. Schools in this study served populations across many socioeconomic levels. Measures of reading and mathematics achievement were obtained using standardized achievement tests, including the Iowa Test of Basic Skills, the California Test of Basic Skills, and the Stanford Achievement Test. Findings indicated that students

with a high sense of community showed significantly greater academic motivation and performance, a liking for school, empathy and motivation to help others, and conflict resolution skills. A high sense of community was also linked to greater enjoyment of class, a stronger learning motivation, stronger commitment to democratic values, a higher sense of efficacy, and more frequent altruistic behavior. This same study even suggested that creating a high sense of community may help greatly to "level the playing field" for students of low socioeconomic status (Schaps, Lewis, & Watson, 1997).

Lewis (1995) found that Japanese elementary teachers believed that building a sense of classroom community was essential to support instruction, and they devoted a great deal of time and energy to building friendships and involving students in classroom management. Unfortunately, many methods that American schools had traditionally used to promote hard work and learning, such as competition, awards, and achievement-based grouping, were all likely to undermine a sense of classroom community. When students worked in isolation, they were unlikely to see each other as helpful. If they were in competition with one another, they were unlikely to see classmates as caring about each other's work (Schaps et al., 1997).

The good news about creating cohesiveness through classroom communities was that many things could be done with a modest investment of time and energy (Schaps et al., 1997). Martin (1992), recalling the success that Montessori had with the street urchins of Rome in the school she began, suggested that educators could serve the great needs of students by creating what she called a "school home" where the students would learn not only the three Rs, but also the three Cs: care, concern, and connection. The concept of the school home was essentially the same as that of the classroom community.

A limited number of studies have been conducted to date that clearly show a relationship between sense of community and student motivation, commitment, and school performance, but the findings were generally encouraging. Goodenow (1993) studied 353 sixth, seventh, and eighth grade students in a suburban New England middle school. A large majority (93%) were white and of European-American ancestry. The School Opinion Questionnaire was administered during regular English classes. The Class Belonging and Support Scale was also utilized. Goodenow found positive relationships between urban middle school students' feelings of belonging and their academic motivation and effort. Bryk and Driscoll (1988) found positive relationships between a communal school organization and high school students' motivation, academic interest, and performance. Solomon, Watson, Battish, Schaps, and Delucchi (1992) found numerous positive associations between a sense of the classroom as a community and students' academic and interpersonal attitudes and motivations. These studies supported the idea that cohesiveness and a feeling of classroom community went hand-in-hand and could be essential in creating a positive classroom climate.

Montoya and Brown (1990) were involved with one of the more recent studies regarding the relationship between cohesiveness and academic achievement. Participants were members of eight sixth grade classes. Four of the classes were in elementary settings, and four were in middle school settings. Classes were matched as closely as possible according to economic status and ethnic composition. The math, reading, and overall scores on the California Test of Basic Skills were correlated. The School Climate Inventory Instrument measured school climate perception scores. Findings revealed that elementary and middle school students perceived school climate at essentially the same

levels. Students' perceptions of cohesiveness and total battery scores were significantly and positively correlated.

Friction

Friction, the amount of tension among students and staff, was another area of interest involving the environment. Researchers tried to determine whether or not a relationship existed between friction and academic achievement. Chavez and Cardenas (1980) studied a group of sixth grade classrooms in schools having both English bilingual bicultural education programs and non-bilingual education programs. The participating schools were located in northern and southern New Mexico. Data collected included age, sex, ethnicity, type of classroom (bilingual or nonbilingual), and third and fifth grade California Test of Basic Skills achievement scores in language arts, reading, and the battery total. Four elementary schools from two school districts were included. A total of 157 students were involved in the study. The instrument used to obtain the climate scores for the study was a modified version of the My Class Inventory. The modified instrument used all climate scales except that of difficulty. A step-wise regression was utilized. Chavez and Cardenas found that the lower the degree of friction perceived, the higher the students' levels of achievement would be.

A 1981 study by Haertel, et al., began with a search including Dissertation Abstracts, the Education Index, Psychological Abstracts, and the Social Science Citation Index. On-going, unpublished studies known by the authors were also considered for inclusion. All studies involved naturalistic classroom settings in kindergarten through twelfth grade that reported both simple and partial correlations between students' perceptions of the climate of their classes compared with end-of-course learning. The search yielded 12 investigations of 10 data sets that reported 734 correlations calculated

from a total of 17,805 students in 823 classes. Environmental measures had internal consistency reliabilities between 0.41 and 0.86. Outcome measures included standardized achievement tasks as well as affective and behavioral measures. Ten of the 12 included some cognitive measure of achievement. Most of the investigations employed the Learning Environment Inventory (LEI) in original, simplified, or shortened form. In the analyses, the directions of LEI scale-learning outcome correlations were summarized for each independent study, and all studies were given equal weight. In the regressions, however, each of the 734 correlation coefficients was treated as a separate observation. Special procedures were developed for the regressions to give each data set equal weight, and jacked-knifed estimates of the regression coefficients were employed to afford statistical independence for significance tests. Regression equations revealed 10 of the 18 coefficients to be significant at the 0.05. The researchers determined that low friction in the classroom resulted in a positive correlation with student achievement.

In a study by Deng (1992), results indicated that increased friction in the classroom resulted in academic differences between male and female students. In addition, higher levels of class friction were associated with increased inequality of achievement for students of different racial groups. However, in classrooms with reduced friction, there appeared to be a more equal distribution of academic achievement among students regardless of gender and race. High levels of student satisfaction were associated with a reduction of achievement differences between high socioeconomic status and low socioeconomic status students. That is, students' positive perceptions toward their classes were related to a more equitable social distribution of achievement. It should be noted, however, that when comparing means of the entire sample, no significant relationship could be found to exist between friction and student achievement.

A study in Thailand by Chatiyanonda (1978) examined a sample of 989 twelfth grade physics students in thirty-one classes in Bangkok or nearby provinces. The learning environment was measured with a Thai version of 10 of the scales of the Learning Environment Inventory (LEI), which was used to predict three attitudinal outcomes. Simple correlational analysis revealed that half of the correlations between an LEI scale and a post-test score on an attitude scale were significantly different at the 0.05 level of confidence. It was found that more favorable attitudes to physics learning were expressed in classes perceived as having less friction, as well as other factors.

Walberg and Anderson (1968) used a group of five cognitive and affective pretests administered at the beginning of the school year to predict classroom environment during the year. The sample consisted of 76 high school physics classes, and the classroom environment was measured by the Classroom Climate Questionnaire. Results were compared with five predictor instruments: the Test on Understanding Science, a Physics Achievement Test, the Science Process Inventory, the Pupil Activity Inventory, and a Semantic Differential. The method of analysis was that of canonical correlation. Results revealed one significant correlation: the "achieving" class appeared to have a friendly, democratic, goal-directed character, while the other class seemed to have more friction among members.

Students' perceptions of the learning environment have been explored in a variety of settings. One study by Eash and Rasher (1978) examined 15 inner city schools in a large public school system and seven nationally distributed comparison schools. The My Class Inventory (MCI) was administered to fourth grade students in all schools on a pre- and post-test basis in order to examine changes over a one-year period. The Cognitive Abilities Rating Scale was also used to determine perceptions of climate. The relationship

between achievement and student perceived learning environment was examined using the school as the unit of analysis. To examine the relationship between achievement and student perceived learning environment, five sets of seven regression analyses were performed. Results indicated that when using grade equivalent scores, there was confirmation of a relationship between the learning environment and achievement for the 19 schools for which achievement data were available. Results further indicated that increased friction was found to be negatively correlated with higher academic achievement.

Anderson's study (1970) yielded surprising results regarding friction. He found that either extreme of friction was positively related to gains in understanding. These results were totally unanticipated. He suggested that in classes with high friction, pupils might have been forced to withdraw from the peer group influence, escape from the conflict associated with classmates, and turn their hostilities into their work. The effect might have been recognized as competition. If extremely high friction was similar to competition (and this was merely speculation), it could have been that extremely low friction was just another term for cooperation. High friction appeared to be best for high ability females, while females of low ability required low friction to be successful.

Simmons (1989) sought to investigate the relationship between students' perceptions of the learning environment and reading achievement. The sample included 177 kindergarten students and 123 primary grade students from 21 elementary schools in north central Florida. Both rural and urban schools were included in the study. The My Class Inventory was used to determine students' perceptions of the learning environment. These scores were compared with the California Achievement Test scores using Pearson correlation procedures and multiple regression. The alpha levels for the tests of

significance were set at .01. Results of the study revealed that friction was negatively related to achievement. In other words, classrooms with greater friction resulted in a decrease in student achievement.

Dunn and Harris (1998) studied a group of 230 fourth grade students in the southeastern part of the United States. Their purpose was to examine selected factors associated with classroom climate as perceived by elementary school students and to explore the relationships between those factors and academic achievement. The sampled classrooms were fairly evenly divided along gender lines. These students were administered the short form of the My Class Inventory, and they also took the state mandated achievement exam. The dependent variable areas included reading, math, and language. A stepwise multiple regression analysis was performed at the .05 alpha level of significance. Results of this particular study indicated that cohesiveness appeared to have no significant relationship to student achievement.

Satisfaction

An effective school climate has been described by White (1986) as a school environment in which the staff, students, and patrons attain high levels of satisfaction and productivity. Kelley (as cited in White, 1986) stated that climate consists of two major dimensions – satisfaction and productivity. He described satisfaction as the sense of fulfillment of needs an individual experiences, along with enjoyment and happiness, as a result of the environment.

Since the 1950s the literature has consistently reported that the relationship between satisfaction and productivity is neither predictive nor causal. This lack of predictive link between satisfaction and productivity led most researchers and theorists to conclude by the 1960s that morale studies were important only if measures of satisfaction

were sought, but such studies were relatively meaningless for use in making inferences about productivity (Anderson, 1982). This stimulated a number of studies based on the assumption that a direct and casual link between human satisfaction and human productivity exists (Wren, 1992).

Even before there was an interest in school social climate emanating from effective schools' literature, theorists and researchers were exploring the notion of quality of school life as an outcome process of schooling. To these investigators, school satisfaction for students was comparable to job satisfaction for adults. Assessing the environment was important to determine the impact of the school setting on student attitudes and behavior. General satisfaction was seen as important to students in school as it was to adults at work in terms of daily mental health. Furthermore, positive reactions to school could increase the likelihood that students would stay in school longer, develop a lasting commitment to learning, and use education to the students' advantage. This idea was supported by researchers who believed that positive social environments and positive learning outcomes went hand in hand (MacIntosh, 1991).

A central element of classroom learning has been the design of activities and tasks. Students' perceptions of these not only influenced how they approach learning; these perceptions also had important consequences for how they used available time (Good, 1983). Embedded in tasks was information that students used to make judgments about their ability, their willingness to apply effort, and their feelings of satisfaction. Tasks that involved variety and diversity were more likely to facilitate an interest in learning (Rosenholtz & Simpson, 1984), and students were more likely to approach and engage in learning when they perceived meaning in an activity (Brophy, 1987).

Cullen (1969) studied a sample of eighth graders. All 372 students, except slow learners (who were not accessible), were tested in a large northeastern Ohio city. The Junior High School Student Opinion Poll was used to assess attitudes of these students. The achievement and attitude marks received by each student while in grades seven and eight were obtained from school records or report cards. The Ohio Survey Tests were used as measures of academic achievement, and the investigator developed self-attitude scales. The components of school satisfaction were determined by a factor analysis for the responses of the total group to the Student Opinion Poll. These scores were then correlated with other variables at a significance level of .05. Results indicated that satisfaction was significantly correlated with achievement. The study further suggested that school satisfaction could be improved if teachers would place greater emphasis on reducing student fear of the difficulty of the subject.

White (1986) wanted to measure the relationship between school climate (as defined by teacher satisfaction), classroom climate (as defined by student satisfaction), and student achievement. He used the Work Environment Scale (WES), Classroom Environment Scale (CES), and Comprehensive Test of Basic Skills (CTBS) in a study involving about 800 seventh though eleventh grade students and 39 teachers in southwest Florida. Approximately two-thirds of the students lived in suburban areas, and the remaining third lived in urban areas. White used an ex-post-facto correlational design. Pearson product-moment correlation coefficients were computed at an alpha level of 0.05. The statistical software package used for analysis purposes was Statistical Package Software System (SPSS) version 2.1. Mean scores for the three major dimensions and nine subscales of the WES and CES were computed. In addition, the mean scores for the teacher and student total battery on the WES and CES and mean scores for the student total

battery on the CTBS were computed. White found a positive and significant relationship between classroom climate and student achievement ($\underline{r} = 0.57$). His research also suggested that the higher the student satisfaction with the classroom environment, the higher the achievement would be.

Fraser and Fisher (1983) agreed that satisfaction, in addition to other factors, was highly correlated with learning. In their study, a total of 29 variables were used in exploring relationships between achievement and environmental perceptions. Student achievement was measured at the beginning of the school year and again at the end of the same school year, using six affective and three cognitive outcome measures. The sample consisted of a representative group of 116 eighth and ninth grade science classes in 33 schools in Tasmania, Australia. Both suburban and rural schools were included. Data was obtained from about 1,000 students. The Individualized Classroom Environment Questionnaire (ICEQ) was used to determine perceptions of the classroom environment. Cognitive outcomes were measured by the Test of Enquiry Skills, including Comprehension of Science Reading, Design of Experimental Procedures, and Conclusions and Generalisations (sic). The first set of analyses for each outcome post-test involved performing a hierarchical regression analysis utilizing sets of student background characteristics, actual environment variables, and actual preferred interactions. These researchers determined that when students were satisfied with their classroom, they learned more content, and they liked school and the subjects being taught.

Cullen and Katzenmeyer (1970) examined the relationship between achievement and perceived attitudes among eighth grade students. The component of school satisfaction was measured by the Student Opinion Poll, and the relationship of this

component was compared with various achievement and ability scores through factor analysis. Four components of school satisfaction were examined: teacher student relationships, student peer relationships, subject matter difficulty, and subject matter interest. They found that certain components of school satisfaction were significantly related to achievement, and these components significantly increase the multiple correlation between ability and achievement. It was felt, however, that further research was needed to better define the nature of the school satisfaction components.

Chavez and Cardenas (1980) agreed with the importance of satisfaction in the learning environment. These researchers found that Chicano and non-Chicano students achieved at higher levels in language arts, reading, and total battery achievement when the students' perceptions of satisfaction was high. Also, Chicano students needed to perceive twice the amount of satisfaction to experience the same achievement level in reading and total battery as non-Chicanos.

Wren (1992) was involved with a study to determine the relationship between the achievement level of 257 students enrolled in sixth grade reading classes and the students' perceptions of school climate and school satisfaction. Subjects in the study were from a junior high school in northwest Mississippi town with a population of about 6,400. Approximately 45% of the population was male, and 55% was female. The community was predominantly rural and agrarian. Two groups of subscales from the National Association of Secondary School Principles (NASSP) School Climate Survey identifying students' perceptions of climate and satisfaction were tested to determine which subscales would predict student outcomes in terms of academic achievement as measured by the total reading battery score of the Stanford Achievement Test. The results of data collection were tested using a Pearson product-moment analysis and a stepwise multiple

regression analysis. The significance of each predictor variable was measured by an F-test at 0.05 level. Based on the data analyzed, a significant correlation was found between student satisfaction and student achievement.

Although there has been a body of research suggesting that there is a relationship between satisfaction and student achievement, other studies were not so conclusive. A study by Deng (1992) examined 875 fourth grade students. His purpose was to construct a multilevel analytic model to specify relationships between classroom climate factors and mathematics achievement of students in Tennessee. He compared means of the Tennessee Classroom Climate Inventory and the Tennessee Comprehensive Assessment Program. A multi-level analysis of the data was conducted using the HLM computer program. Analysis included three steps: (a) apportioning variations between and within classes using a one-way ANOVA and chi-square analysis, (b) assessing the homogeneity of the regression assumption, and (c) assessing the effects of class climate factors. Surprisingly, results of this study indicated no significant relationship between satisfaction and class mean achievement ($t = -1.87$). Likewise, Anderson's (1970) study found no significant relationship between satisfaction and learning. Research by Dunn and Harris (1998) indicated the same results. They, too, found no relationship between satisfaction and student achievement.

Competitiveness

One extremely important consideration in the development of classroom climate was that of cooperation verses competition. A cooperative goal structure existed when students perceived that their own achievement goals were dependent on how well other students achieved their goals. Cooperative goal structures resulted in the most accurate communication between students, constructive conflict management, a decreased fear of

failure, increased levels of trust, greater peer acceptance, and improved support and emotional involvement in learning (Paradise, 1994).

Competitive goal structures existed when students competed with each other for achievement goals. When competing cliques evolved, students were more likely to focus on negative attributes of others and were more likely to become social isolates, rejected by others (Paradise, 1994). Ames (1984) reported that social comparison in the public classroom was extensive, including announcement of high and low scores, charts of students' progress, ability grouping, and displays of selected papers and achievements. The impact of this type of competition on students when they compared unfavorably could be seen in the students' of their own ability, avoidance of risk taking, use of less effective learning strategies, and negative affect directed toward self. Students' self-evaluations of their ability were more negative when the students were focused on winning than when they were focused on improving their performance. In classrooms characterized by public evaluation, students became more focused on their ability and the distribution of ability in the classroom group. Many students not only came to believe that they lacked ability, but this perception became evident among peers. Because performance oriented or competitively oriented environments encouraged a focus on ability, they did not support the use of strategies that required sustained effort over time. Consequently, conceptual learning might have been negatively affected when evaluation was perceived as having direct consequences for oneself (Garner, 1990). It was not the mere availability of social comparison information that was problematic, however; when this type of information was emphasized the link between effort, outcome, and affect became undermined (Jagacinski & Nicholls, 1987). As students progressed through school, evaluation became more formal and more closely tied to performance criteria

than simply to assignment completion. When evaluation was normative, emphasized social comparison, was highly differentiated, and was perceived as threatening, it contributed to a negative motivational climate. Moreover, this type of evaluation contributed to avoiding and accepting failure (Covington & Omelich, 1985).

According to Ames (1992), an important goal for teachers was to develop an environment that accepted individual differences and allowed all students to develop a feeling of belonging. Competition fostered cautious, defensive interaction and misleading and threatening communication. Individualistic goal structures were formed to separate students, reduce interaction, and allow independent learning experiences. In individualistic settings, students worked by themselves without interacting with one another (Paradise, 1994). In order to avoid such isolation the teacher may have chosen to incorporate varied groupings. Ames (1992) found that a diversity of grouping arrangements providing opportunities for peer cooperation and cooperative learning minimized individual fears of failure and competition. The use of cooperative groups was also found to be more effective in creating a positive atmosphere (Paradise, 1994). Compared with traditional methods, cooperative learning was found to promote better relationships among different ethnic groups and greater acceptance of students who had disabilities (Slavin, 1981). When students' psychosocial needs were met, they performed academically. Interpersonal student relationships were important to meeting psychosocial needs. In classes where students disliked one another, factors such as hostility, competitiveness, distrust, insecurity, and aggression developed, preventing students from performing well (Paradise, 1994). Therefore, the use of varied grouping arrangements may have been used to help counteract these factors.

Talmage and Walberg (1978) used the subscale of competition along with several other variables as part of an evaluation study to select a basal reading series for adoption in a large school district and to explore other factors possibly related to reading achievement. Four reading series were pilot tested in 12 schools in grades one, two, three, and six. A fifth series, the schools' current adoption, provided baseline data. A total of 60 classes participated, with both pre and post tests administered, including the Metropolitan Reading Readiness Test and the Scholastic Reading Achievement Test. Data were analyzed using a step-wise multiple regression. Most of the variables incorporated in the study did not account for significant differences. Nevertheless, competitiveness in the learning environment proved to be the only variable which predicted post-test reading scores after pre-test effects were removed. As students perceived higher levels of competitiveness, reading achievement scores dropped. The higher the competitiveness perceived by students, the lower the reading achievement scores. Talmage and Walberg concluded that competitiveness was the crucial variable for reading progress in the study. They confirmed that if they had not used it as a variable, valuable information about aspects of the natural setting affecting reading achievement would have gone undetected.

Fisher and Fraser (1980) explored the relationship between competition and academic achievement. They examined the predictive validity of a modified version of the My Class Inventory (MCI) among a sample of 2,305 twelve-year-old students in 100 classrooms in Tasmania, Australia. Multiple regression analysis was used to estimate the amount of variance accounted for by MCI dimensions before and after controlling for the parallel pretest and general ability. The researchers found that the MCI scales

accounted for a significant amount of learning outcome variance at the 0.05 alpha level, indicating that there was a strong connection between competition and achievement.

Moos and Moos (1978) studied 19 classes from one high school in which students were almost exclusively in a college preparatory curriculum. The subject matter included math and algebra, foreign languages, biology, English, art, and accounting. The classes were all about the same size, and student absenteeism records were kept for students in each class. Students' final grades were obtained at the end of the semester. Information concerning the dimensions on which classroom social environments differed was obtained for the Classroom Environment Scale, which was given to the students in each class in the middle of the semester. A correlational analysis was used with an alpha level of 0.05. Results indicated that students may have learned more in classrooms that emphasized competition and difficulty, but they apparently also were absent more often from these classrooms. Since absenteeism was related to poorer grades and/or later dropping out, an emphasis on competition may have encouraged cognitive growth among some students but at a great personal cost to others.

Slonaker (1979) investigated the relationship between students' perceptions of the classroom climate and reading gains of sixth grade students. Her sample included 269 students randomly selected from sixth grade classrooms. Instruments included the My Class Inventory, the Otis-Lennon Mental Ability Test, and the Science Research Associates Assessment Survey. Data was analyzed using the Pearson product-moment correlation and multiple regression with an alpha level of 0.05. Slonaker's findings did not reach statistical significance in the area of competition.

Difficulty

A final component in determining classroom climate was that of difficulty. Lepper and Hodell (1989) stated challenge was a factor incorporated in the design and structure of a learning task. They argued for tasks that offered personal challenges to students. According to their study, when tasks were enriched with such a motivational embellishment, the tasks were more likely to create an intrinsic purpose in learning.

Burkman and Brezin (1981) reported that students tended to try to meet established performance standards as long as they were perceived to be achievable. When standards were set too high and learning tasks became too difficult, however, the results were discouragement and diminished performance. The subjects for this study were 1,089 students enrolled in the first segment of a physical science course. Students were in 32 classes taught by 12 teachers. Fifty-seven percent of the students were boys, and forty-three percent were girls. The study was part of the 1978-1979 national field test for 16 instructional modules being developed by the Individual Science Instructional System.

Schunk (1981) tested the hypothesis that student effort based on prior student achievement was effective in promoting subsequent achievement behaviors. Forty students lacking in subtraction skills were selected from two elementary. The 26 males and 14 females were predominantly middle class. Teachers initially identified students who lacked subtraction skills. Those students received training and opportunities to solve subtraction problems. Self-efficacy was measured using ranges from 10 to 100. Significant F ratios were analyzed using the Newman-Keuls Multiple Comparison Test. Results showed that attribution for prior achievement led to more rapid training progress, greater skill development, higher precepts of self-efficacy, and more accurate self-appraisal of capabilities. In contrast, attribution for future achievement did not

influence students' achievement outcomes. Effort attribution was most effective with tasks perceived as intermediate in difficulty.

Walberg (1969) used the Learning Environment Inventory in a random sample of physics classes throughout the nation. Six cognitive and noncognitive variables were also used, including the Test on Understanding Science, the Welch Science Process Inventory, the Physics Achievement Test, the Academic Interest Measure, the Pupil Activity Inventory, and the Henmon-Nelson Test of Mental Ability. Data were collected from classes in a sample of 75 teachers. Class means were calculated on all variables, and these became the units of analysis. Canonical correlations were tested for significance. Results indicated that students in classes seen as more difficult achieved greater physics and science understanding.

Walberg and Greenberg (1997) indicated that students who rated their classrooms high on challenge using the Learning Environment Inventory achieved more academically, had better attitudes toward the subject matter, and engaged more often in non-required activities related to the subject matter. A similar study by Haertel, et al., (1981) also revealed a positive correlation with the subscale of challenge. Anderson (1970) found a positive relationship between difficulty and achievement gains for low ability girls. However, high ability students showed no significant relationship between subject difficulty and achievement gains. Anderson's findings suggested students performed best when challenged. The study also suggested that students only worked hard enough to achieve a certain level; but when the work was perceived as difficult, students probably prolonged their efforts before assuming they had reached their personal goal. Stated in another way, students applied themselves out of a fear of failure, and they continued to work hard as long as their fear existed.

Limited research was available in the area of subject difficulty, and the results were inconclusive. While some studies suggested that a challenging curriculum was essential in developing a positive classroom climate, others indicated that when the subject matter became too difficult, academic achievement was threatened.

Summary

The quality of education has been reflected not only in the subjects taught and achievement levels reached, but also in the learning environment. The environment has both reflected and influenced the behavior of students, and it has been affected by events within and outside of the school (Condition of Education, 1998). Most educators and researchers have agreed that the total environment should be comfortable, pleasant, and psychologically uplifting; should provide a physical setting that students find educationally stimulating; should produce a feeling of well being among its occupants; and should support the academic process. These goals, while lofty, have been considered to be achievable through the cooperative efforts of imaginative educators (Castaldi, 1987). It has been educators' responsibility to use research findings to implement any and all climate factors conducive to creating an environment that may result in increased student achievement, but these specific environmental factors have still been considered to be rather ambiguous.

One of the strongest traditions of classroom environmental research has involved investigation of the predictability of students' cognitive and affective learning outcomes from perceptions of their classroom environment. The studies reviewed here did not provide consistent and convincing support for the predictive validity of students' perception in accounting for appreciable amounts of variance in leaning outcomes.

CHAPTER 3

METHODOLOGY

Methods

Three distinct methodologies for assessing and studying classroom psychosocial environments can be clearly delineated. The first approach involves observation and classification of classroom interaction. The technique of observing and classifying events in the classroom environment is known as interaction analysis. This technique involves the coding of classroom communication (primarily verbal) according to some category system. This task of classification can be performed directly by an observer or can be recorded on audiotape or videotape for later classification (Fraser, 1981; Fraser & Walberg, 1981).

In the second methodology, the classroom environment can be studied and measured using techniques referred to as naturalistic inquiry, ethnography, or the case study approach. This approach would be considered a qualitative study. Comparatively few studies of classroom environments have systematically applied the techniques of naturalistic inquiry and case study (Fraser, 1981).

The third method focuses on students' and teachers' perceptions of the classroom environment. Students spend a vast amount of time, approximately 15,000 hours, in school classrooms (Rutter, Maughan, Mortimore, Ouston, & Smith, 1979). Consequently, the quality of life in these classrooms is of great importance, and students' reactions to and perceptions of their school experiences are significant.

Student Perceptual Measures

Several advantages to the use of student perceptual measures in preference to classroom interaction techniques are offered. First, perceptual measures are more economical than classroom interaction techniques that involve the expense of trained observers and large amounts of hand coding. Second, perceptual measures are based on students' experiences over many lessons, while interaction data usually are restricted to a small number of lessons. Third, perceptual measures involve the pooled judgements of all students in a class, whereas interaction techniques typically involve only a single observer. Fourth, students' perceptions, because they determine student behavior, can be more important than observed behaviors. Fifth, perceptual measures of the environment typically have been found to account for considerably more variance in student learning outcomes. Finally, students seem quite able to perceive and weigh classroom stimuli and render valid judgements about psychosocial characteristics of their classrooms (Fraser & Walberg, 1981). This final method, students' perceptions, will be utilized for this study through the use of a survey.

According to Taylor (1989), climate had to be a first step any educator considered in an attempt to improve student achievement. For schools to be effective, a humane and healthy school climate affecting the life and activities of students and staff was a necessity. Because climate influenced the affective domain, it was difficult to isolate from skills, knowledge, and attitudes that students gained during their academic studies. Nonetheless, experience suggested that more efficient learning occurred in a wholesome environment. Taylor believed that six distinct components had to be present in order to develop a healthy and humane climate: respect, involvement (empowerment), social and academic growth, high morale, and collegiality. Keefe, Kelly, and Miller (1985) agreed,

concluding that climate assessment should be the first step in any school improvement proposal. They explained that this view was a common recommendation of both researchers and practitioners who had studied school environments. The benefits derived from a comprehensive understanding of the effects of students' perceptions of climate could lead to identification of various measures school faculties could take in developing effective interventions to produce improved academic performance of students.

A milestone in the historical development of the field of learning environments occurred when Herbert Walberg and Rudolf Moos began seminal independent research. Walberg (1979) developed the Learning Environment Inventory (LEI) as part of the researcher and evaluation activities of the Harvard Physics Project. Moos (1979), of Stanford University, developed social climate scales for various human environments including the Classroom Environment Scale (CES). Walberg and Moos's pioneering work built on earlier foundations of Lewin (as cited in Fraser, 1981) and Murray (as cited in Fraser, 1981). The work of Walberg and Moos was important because they provided a foundation upon which later predictive validity studies have been built, and because they demonstrated the use of a variety of important methodological techniques. These techniques included the use of interaction and curvilinear environment terms, various multivariate data analysis techniques (e.g., multiple regression and canonical analysis), and a system of data collection in which testing time could be reduced by having different random subsamples of students within a given class responding simultaneously to different parts of a whole test battery. Generally, their studies involved the prediction of learning outcomes measured at the end of a school year from students' perceptions of the classroom environment, most often with statistical control for performance on corresponding beginning-of-year learning outcome measures.

Research Design

Primary to the purpose of relationship studies is identifying possible causes and effects of important educational phenomena, such as academic achievement. This type of correlational research is especially useful for exploratory studies in areas where little is known. The first step in examining a relationship is to identify specific variables that show promise of being important determinants of the characteristic or behavior pattern under investigation. A review of existing research and theory is usually helpful in identifying these variables, since although relationship studies are exploratory, they should be guided by such research and theory in order to increase the likelihood of finding variables that cause the behavior pattern of interest (Gall et al., 1996).

The next step in correlational research is to select research participants who can be measured on the variables that are being investigated. These participants must be reasonably homogeneous; otherwise relationships between variables might be obscured by the diversity of the group. Data for correlational research can be obtained by various methods including standardized tests, questionnaires, interviews, or observational techniques; but the data must be quantifiable. In a simple relationship study, the data are analyzed by correlating scores on a measured variable that represents the phenomenon of interest with scores on a measured variable thought to be related to that phenomenon. The results of the comparison will be expressed in terms of a correlation coefficient, which can be either positive or negative. Gall et al., (1996) defined a correlation coefficient as “a mathematical expression of the direction and magnitude of the relationship between two measured variables" (p. 756). It must be understood that correlations obtained in a relationship study cannot establish cause and effect between variables. Results can only be expressed in terms of a relationship.

In a correlational study there are two types of variables. The independent variables, also known as predictor variables, are so called because they are independent of the outcome, yet they are assumed to influence the outcome. The dependent variables, also known as criterion variables, are so called because they are dependent on the independent variables. In other words, the outcome presumably depends on how the input variables are manipulated (Isaac & Michael, 1995). When variations in the dependent variable are attributed to changes in only a single independent variable, this is known as simple linear regression; yet, theories frequently suggest that several factors simultaneously affect a dependent variable. Multiple linear regression analysis is a method for measuring the effects of several factors concurrently. The concept of multiple regression analysis is identical to that of simple regression analysis except that two or more independent variables are used simultaneously to explain variations in the dependent variable. More generally, the estimated coefficient for any independent variable estimates the effect of that variable while holding the other independent variables constant. For this reason, multiple linear regression analysis results come closer to indicating a pure effect (Schroeder et al., 1986).

A univariate analysis of variance (ANOVA) consists of two kinds of variables: independent and dependent. In a one-way ANOVA only one independent variable is considered, but there can be any number of levels of the independent variable. The dependent variable is presumed to be the result of manipulating the independent variable. The procedure for testing a null hypothesis against an alternative hypothesis is the analysis of variance. The variation of the scores within groups is compared with the variation of the scores between the group means and the mean of the total group (Hinkle et al., 1998).

In developing a good research design it is extremely important to consider reliability and validity. According to Isaac and Michael (1995) reliability refers to the "accuracy (consistency and stability) of measurement by a test. This is determined by retesting an individual with the same test" (p. 32). Validity indicates "the degree to which the test is capable of achieving certain aims" (p. 32). In other words, does the test measure what it intends to measure? Both reliability and validity are vital to an effective research design.

Assessing the Learning Environment

Classroom environment research has investigated the association between students' cognitive and affective learning outcomes and their perceptions of psychosocial characteristics of their classrooms (Diamantes, 1994). Research on the socio-psychological environment of the classroom emphasizes perceptual and judgmental variables, particularly those that are rated rather than counted. These perceptions and judgments have not been those of outside observers. Rather, investigators of the learning environment often ask students to judge their own classroom environment. As the primary consumers of education, students stand at a good vantage point for making such judgments. Compared with a short-term observer, students can weigh in their judgments not only how the class is presently, but also how it has been since the beginning of the year. They are able to compare the child-client point of view of their class with those in past grades and with other classes they are currently taking. Students form a group of about 20 sensitive, well-informed judges of the class, whereas an outside observer is a single judge who has far less data and may be insensitive to what is important in a particular class (Walberg & Haertel, 1980).

Investigators of learning environments tend to use general ratings of the environment, rather than counts of specific teacher or student acts. These subjective ratings of perceived behavior are referred to as high inference measures. Low inference measures, on the other hand, involve specific teacher behaviors. Low-inference scales have the advantage that, if valid, they directly suggest changes in specific teacher behavior. However, they are generally substantially less valid in predicting learning outcomes than are high-inference measures (Walberg, 1971).

Development and Use of the My Class Inventory

According to Walberg (1969), the Getzels and Thelen (1960) theory of the class as a social system had proven successful in research. This theory suggested that in classrooms personalities, needs, and role expectations interacted to form a climate in which group behavior, including learning, could be predicted. The Getzels-Thelen theory was used as a guide for constructing a climate survey known as the Learning Environment Inventory (LEI). This instrument was used to measure the social climate of learning in the classroom as perceived by students. The original form of the LEI contained 14 scales, but in 1969, a 15th subscale was added. The climate dimensions, or scales, included cohesivenss, diversity, formality, speed, environment, friction, goal direction, favoritism, cliqueness, satisfaction, disorganization, difficulty, apathy, democraticness, and competitiveness. In selecting these 15 climate dimensions, an attempt was made to construct the scales with only the concepts previously identified as good predictors of learning (Chavez, 1984).

Many researchers over the years have worked to identify which aspects of the classroom that have the greatest impact on student learning. These attempts have resulted in classroom climate inventories for use in varied learning settings (Chavez, 1984). One

of these instruments, which was developed for elementary students and used with success from kindergarten through junior high school, is the My Class Inventory (Fraser & Frisher, 1983).

The My Class Inventory (MCI) was developed as a simplification of the widely used Learning Environment Inventory (Diamantes, 1994). The MCI differs from the Learning Environment Inventory (LEI) in four ways. First, in order to minimize fatigue among younger students during its administration, the MCI has been shortened. Second, the wording of the many original LEI items has been simplified to enhance readability for younger students. Third, the LEI's four-point response format has been changed in the MCI to a two-point response format (Yes, No) in order to make responding easier for 8 to 12-year-olds. Fourth, responses to the MCI are provided on the same sheets as the questions, rather than on a separate response sheet, in order to reduce errors in the recording of answers (Fraser & Fisher, 1982). The MCI is also more economical in the fact that it measures five different dimensions, yet contains only 25 items (Fraser, 1981).

The My Class Inventory asks students questions about how satisfied they are with their classroom and how difficult they think the work is. Students are also asked about the friction, competition, and cohesion they think exists in their classroom. These five dimensions – cohesiveness, friction, satisfaction, difficulty, and competitiveness – were selected because climate research indicated a high correlation with learning (Fisher & Fraser, 1982; Fraser & Fisher, 1982; Fraser & Fisher, 1983).

The short form of the MCI is the most appropriate climate instrument for young students. It consists of 25 statements, with five statements addressing each of the five dimensions. The student reads each statement and circle "Yes" if the statement read describes his/her own classroom or "No" if it does not. After all students in a class have

responded to the inventory, scores for each scale are averaged to provide a classroom climate profile for that classroom (Fuqua, 1989).

According to Arter (1987), the MCI was designed to measure students' perceptions of five dimensions of classroom social climate and was intended for use with students ages 8 though 12. Internal consistency reliabilities for individuals ranged from .62 - .78 (N = 2,305). Interclass correlations for groups ranged from .73 to .88 (N = 100 classrooms). Reliabilities were too low for profiling individual students, but group profiling appeared to be justified. Reliabilities, however, were based only on seventh grade students.

The short form of the MCI has 25 questions in a yes or no format (see Appendix B). Students answer on the test form itself rather than a separate answer sheet. To use the instrument, the researcher must photocopy the questions from an appendix in the test manual after obtaining the author's approval. The test is considered to be easy to administer and score (Arter, 1987). Questions are arranged in cyclic order and in blocks of five to enable ready hand scoring. The first question in each block assesses satisfaction, the second question in each block assesses friction, the third question assesses competitiveness; the fourth question assesses difficulty; and the last question in each block assesses cohesiveness. Upon examining the content of the questions, it becomes apparent that each question relates to one of the five environmental subscales. Thus the meaning of each scale can be clarified simply by examining the questions contained in each block (Fraser, 1989).

In order to score most items, a score of 3 is given for the "Yes" response, and a score of 1 is given for the "No" response. But, for the items with "R" in the "For Teacher's Use" column, reverse scoring is used so that 3 is given for No, and 1 is given

for Yes (see Appendix B). This system is used to allow for consistent scoring in positive and negative statements. Omitted or incorrectly answered items are given a score of 2. The score for each of the 25 individual items are written in the For Teacher's Use column (Fraser, 1989).

The total score for a particular scale is the sum of the scores for the five items belonging to that scale. For example, the satisfaction scale total is obtained by adding the scores given to items 1, 6, 11, 16, and 21, while the cohesiveness total is the sum of the scores obtained for the last item in each block. The bottom of the survey provides spaces where the teacher can record the student's total score for each scale (Fraser, 1989).

Development of the Stanford Achievement Test

Norm-referenced achievement tests span a broad range of designs. Many are large-scale, corporately-constructed tests of complex design that are administered nationally to representative samples of students in order to assess our country's educational health. One particular, the Stanford Achievement Test (SAT-9), consists of 13 levels designed for use from kindergarten to high school. It is similar to the Metropolitan Achievement Test, although a little broader in coverage. The content of each subtest was chosen in order to provide representative and balanced coverage of a nationally agreed upon curriculum. It was designed to cover the concepts and skills most commonly taught in U. S. schools. The development process began with careful analyses of the most recent editions of major textbook series in every subject area. It also included the most recent state and district curricula and educational objectives, as well as the most important trends and directions in education according to many national professional organizations. Test specifications were created for every subtest, and these specifications delineated the proportion of the test content to be devoted to each objective in order to

provide representative and balanced coverage of this “national consensus curriculum” (Stanford, 1996, p. 8). Curriculum specialists and content area experts reviewed the tests for breadth, depth, and sequence of tested objectives.

A National Item Analysis Program was conducted in order to determine the appropriateness of each test item, including the difficulty and sensitivity of the items, the grade progression in difficulty, the effectiveness of the options, appropriate administration times, differential group performance, and the reactions of students and teachers to the clarity, format, and test content. The national item tryout took place in February, 1993. Each tryout booklet was administered to about 500 students per grade level across 39 states and the District of Columbia. The entire sample included approximately 140,000 students. School districts were selected according to a stratified random sampling technique, representative of the national school population in terms of socioeconomic status, enrollment, and geographic region. Test results guided the construction of the final form of the Stanford series. Regarding bias, every effort was made to counterbalance any items that favored one group or another. Testing for spring standardization took place in April 1995, with approximately 250,000 students from 1,000 school districts participating. Fall standardization took place in October 1995, with approximately 200,000 students participating (Stanford, 1996).

The Stanford Achievement Test is a nationally normed achievement test series that is widely used throughout the United States as a valid measure of students’ academic achievement levels. The basic battery consists of reading, mathematics, language, spelling, study skills, and listening tests. Science and Social Science are optional and complete the battery. Testing time ranges from 2¼ hours in kindergarten to almost 5½ hours at the upper elementary level. The content of the ninth edition is said to

emphasize thinking skills more so than previous versions. The content is also said to be aligned with the National Assessment of Educational Progress (NAEP) in reading and with the National Council of Teachers of Mathematics (NCTM) standards in math (Cizek, 1998).

As stated before, the MCI items are a simplified version of those on the Learning Environment Inventory, which was revised because of low subscale reliabilities. The authors of the current edition of the MCI examined the ability of the subscales to differentiate between classes and how well the test predicts student outcomes (Fraser, Anderson, & Walberg, 1982). Two reviewers in Buros of Highland Park, New Jersey, felt the instrument has promise but needs more validation work for grades lower than the seventh grade (Fraser & Fisher, 1983). Since the current study involved only sixth grade students, the need for additional validation had to be taken into consideration. For that reason, the Stanford Achievement Test was used to provide the empirical data necessary to discuss the inclusion or exclusion of subscales as predictors of student academic achievement in mathematics.

According to the Stanford Achievement Test, Ninth Edition, there is data to support that the reliability of the Stanford Achievement Test is acceptable for the purposes of this researcher's study (Stanford, 1996). For the Total Math portion, $\underline{R} = 0.94$. The Stanford Achievement Test was selected for use in this study because of its high level of reliability and because the district uses it annually to assess academic achievement for comparison purposes. Use of this particular test produced reliable achievement test data results that could be easily obtained without additional cost or loss of instructional time to the district.

Research Design of Current Study

The purpose of this study was to construct a quantitative model to specify relationships existing between climate factors and mathematics achievement of sixth grade students in selected elementary schools in an suburban district using the My Class Inventory. Permission from the author of this test was obtained through e-mail. The rationale for selecting mathematics achievement scores as the outcome measure for this study was based on research indicating that learning in math tends to be restricted to the school context, while reading and verbal skills are learned both in school and at home. Research suggested that differences in classroom climate had a greater impact on mathematics than on reading achievement (Murane, 1975).

This research study investigated relationships between the selected criterion variable of sixth grade math students' academic achievement levels as measured by the total math score of the Stanford Achievement Test and the predictor variables of school climate perceptions of students as measured by the My Class Inventory. The five predictor variables in the My Class Inventory were cohesiveness, friction, satisfaction, competitiveness, and difficulty. A multiple regression analysis was used to identify the predictor variables that were related to the criterion variable at the 0.01 level of significance. A backward solution was also utilized in order to determine the purest form of the regression model. In addition to the multiple regression analysis, a univariate analysis of variance was used to establish a correlation with the predictor variables as well as gender and socioeconomic factors. After significant F ratios were indicated, post hoc multiple comparison tests were completed with the independent variables of difficulty and friction using the Tukey/Kramer method (Gall et al., 1996). This procedure was used to identify which pairs of means were the most significant.

Sample

The data for this research was extracted from a school district in Texas. The city had a population of approximately 100,000 citizens, with approximately 15,000 students. Schools consisted of 26 sixth grade math classes for a total of 262 students ($N = 262$). Ten schools were selected for participation because they were all on the regular school calendar, rather than the extended year calendar. While the principals of all 10 schools gave permission for participation, teachers from only eight of the schools agreed to be included. Participation by female students ($N = 146$) was slightly higher than participation by male students ($N = 116$). Intact classes, not random individuals, were the primary sampling unit. Other factors influencing school selection included accessibility to the researcher and the general acceptance of each principal and teacher toward school research. Meetings were held with the superintendent and each principal to explain the research. Teachers were contacted through letters, e-mails, and face-to-face conferences. Results remained completely confidential. A coding system was implemented to preserve anonymity. The researcher was unaware of the specific results of individuals, teachers, or schools. Each teacher was given the option of requesting his/her own results of the MCI. Principals only received results relating to student achievement of the entire study, not by classroom or teacher. The MCI was administered by teachers of mathematics during regularly scheduled math classes. A copy of the inventory can be found in Appendix A. The researcher used a correlational research design to determine the effect of classroom climate on student achievement. The correlation between each of the five dimensions of the MCI as they related to student achievement were studied through a multiple regression analysis at a significance level of .01 ($p = .01$). A backwards solution was utilized to determine the purest statistical form of the regression model.

Results were correlated with socioeconomic status of students as indicated on the Parent Permission Form (see Appendix C). Parents were asked to indicate the family's total yearly income. Categories were less than $20,000, $20,000 - $39,000, $40,000 - $59,000, $60,000 - $79,000, $80,000 - $99,000, $100,000 - $150,000, and over $150,000. A one-way ANOVA was completed to determine whether or not a relationship existed between Stanford Achievement math scores and the five independent variables of the MCI. The results of the Stanford Achievement mathematics scores were also compared with the socioeconomic status and gender of students to confirm or refute results of earlier studies by Coleman, et al. (1966) and Edmonds, et al. (1977).

A correlation coefficient describes the extent to which two sets of data are related. It measures the relationship between two variables and is denoted as r. The Pearson product-moment correlation is defined as "the average cross-product of the standard scores of two variables" (Hinkle et al., 1998, p. 111). It was selected as the correlation coefficient for this study because variables were continuous (ratio). These variables had an absolute zero and were equal-interval. In order to test the hypothesis, a Pearson product-moment correlation (r) was obtained between each of the My Class Inventory scales and the Stanford Achievement mathematics scores. Correlations were also obtained between Stanford scores and gender/socioeconomic status. A correlated t-test was utilized to determine the significance of each at .01 significance level ($p = .01$).

After completing the multiple regression analysis, a univariate analysis of variance was utilized at the significance level of .01 ($p = .01$) in order to determine if there was a significant difference among the level means of the independent variables. Post hoc comparison tests were completed on the independent variables of friction and difficulty. A post hoc test is completed whenever the null hypothesis is rejected as the

result of the F ratio exceeding the critical value, indicating some difference among the means. After rejecting the hypothesis, the researcher still needs to determine which combinations of means are not equal, so a post hoc multiple comparison test is used. In this particular study, the Tukey/Kramer (as cited in Gall et al., 1996) method was employed. This method, also called the honestly significant difference (HSD), is designed to make all pairwise comparisons while maintaining the error rate at the pre-established alpha level (.01). The Tukey/Kramer method is also used when comparing groups of unequal numbers (Hinkle et al., 1998). The ANOVA, along with post hoc multiple comparison tests, was completed in order to examine whether or not there was a significant difference among the level means of the independent variables. My Class Inventory scores of 1 through 5 were classified as Group 1 and were considered to be in the low range. Scores of 6 through 10 were classified as Group 2, defining the middle range. Scores of 11 through 15 were classified as Group 3 and were determined to comprise the high range.

CHAPTER 4

RESULTS

Pearson Product-Moment Correlations

In order to investigate relationships between classroom environment perceptions and learning outcomes, the My Class Inventory (MCI) and the Stanford Achievement Test were administered to sixth grade mathematics students. Several steps were taken to analyze the data. The first step involved finding Pearson product-moment correlations between the variables studied and Stanford Achievement math scores. The means of the MCI's five subscales, including satisfaction, friction, competitiveness, difficulty, and cohesiveness, were compared to the means of the total math scores on the Stanford Achievement Test. Descriptive statistics can be found in Table 1.

The MCI allows a maximum of 15 points for each of the five independent variables. Table 1 indicates that students in this study rated satisfaction and competitiveness quite high (11.0 and 11.01), whereas the difficulty level was the lowest response with a mean of 6.42. The national average for the Stanford Achievement Mathematics Test was 50. The results of this study indicated a mean of 62.61. Clearly, this sample of students performed above average on the Stanford Achievement Mathematics Test.

The results in Table 2 indicate that none of the classroom climate scales in this study showed a moderate or high correlation to Stanford Achievement Mathematics

Table 1

Descriptive Statistics of the Stanford Achievement Mathematics Test and My Class Inventory Subscales

Test/Subscale	Mean	Standard Deviation
Stanford Achievement Mathematics Test	62.61	23.89
Satisfaction Subscale	11.0	2.92
Friction Subscale	9.07	2.92
Competitiveness Subscale	11.01	2.82
Difficulty Subscale	6.42	2.14
Cohesiveness Subscale	9.64	3.37

Table 2

Pearson Product-Moment Correlations Between Satisfaction, Friction, Competitiveness, Difficulty,Cohesiveness, and Stanford Achievement Mathematics Test Scores

	Stanford	Satisfaction	Friction	Competitiveness	Difficulty	Cohesiveness
Stanford	1.0	.058	-.186	-.026	-.246	-.050

Test scores at the sixth grade level. Friction, competitiveness, difficulty, and cohesiveness scores all indicated negative relationships, but they were at a low levels of correlation. These results suggest that friction, competitiveness, difficulty, and

cohesiveness have a low negative impact on classroom climate. Friction and difficulty showed the strongest relationship (r = -.186 and -.246 respectively), but again, results indicated low negative correlation to mathematics achievement. The only positive correlation was that of satisfaction (r = .058), but this scale also indicated low correlation to mathematics achievement, suggesting that there is a low positive impact on mathematics achievement.

Multiple Regression Analysis

The second step in the data analysis involved the use of multiple regression analysis to investigate whether a combination of classroom environment factors would have predictive power for mathematics achievement. Table 3 shows the R^2 value was .105. This indicates that all five classroom climate indicators combined together explained only 10.5% of the variance in the Stanford Achievement Mathematics Test scores. The table also indicates a low positive correlation between combined factors and Stanford math scores.

Table 3

Model Summary – Multiple Regression Analysis

Model	R	R^2	Adjusted R^2	Standard Error of the Estimate
1	.324	.105	.087	22.83

A backward solution was utilized to determine the purest form of the regression model. In this approach, all predictor variables are initially entered into the regression model, and they are deleted if they do not make a significant contribution to the regression. In this study, the variables of satisfaction and competitiveness were removed, leaving the predictor variables of cohesiveness, difficulty, and friction. This resulted in an R^2 value of .103, indicating that only 10.3% of the variance in Stanford Achievement Mathematics Test scores could be explained by the remaining climate indicators combined together (see Table 4).

Table 4

Backward Solution Model Summary – Multiple Regression Analysis

Model	R	R^2	Adjusted R^2	Standard Error of the Estimate
3	.322	.103	.093	22.75

Note. Predictors: Cohesiveness, Difficulty, Friction. Dependent Variable: Stanford Achievement Mathematics Test Scores.

Univariate Analysis of Variance (ANOVA): My Class Inventory

The results of the multiple regression analysis were unexpected and did not always support past research. Some of the past studies, however, incorporated other statistical measures. Therefore, a univariate analysis of variance was completed in order to determine whether or not there was a significant difference among the level means of

the independent variables. Responses were divided into three groups. My Class Inventory scores of 1 through 5 were classified as Group 1. These scores were considered to be in the low range. Scores of 6 through 10 were classified as Group 2, considered to be in the middle range. Scores of 11 through 15 were classified as Group 3, comprising the high range. An ANOVA was utilized to examine the deeper level of specificity in describing significant differences among the levels of the independent variable and the dependent variable (see Table 5).

Table 6 indicates the results of the univariate analysis of variance. The independent variables of satisfaction, competitiveness, and cohesiveness did not appear to be significant. Friction (sig. = .006) and difficulty (sig. = .002), however, appeared to be significant at the alpha level of .01. Results from this table indicate statistically significant differences exist between the three levels of friction and the independent variable of the Stanford Achievement Mathematics Test for sixth grade students and between the three levels of difficulty and the independent variable of the Stanford Achievement Mathematics Test for sixth grade students.

Research Questions

Research Question One

What is the relationship between students' perceptions of the classroom climate and mathematics achievement? As stated in the null hypothesis, there is no relationship between students' perceptions of the classroom climate and mathematics achievement. According to the correlation coefficient analysis results, the five subscales of the My Class Inventory revealed low correlations between the MCI subscales and mathematics achievement, as measured by the Stanford Achievement Mathematics Test (Table 2).

Table 5

ANOVA – Descriptive Statistics: My Class Inventory Subscales

Subscale	Mean	Standard Deviation	N
Satisfaction			
Group 1	62.28	22.25	18
Group 2	60.04	24.83	72
Group 3	63.72	23.71	172
Total	62.61	23.89	262
Friction			
Group 1	66.03	20.62	35
Group 2	65.61	23.00	149
Group 3	55.35	25.57	78
Total	62.61	23.89	262
Competitiveness			
Group 1	66.60	19.51	15
Group 2	62.13	24.82	69
Group 3	62.46	23.95	178
Total	62.61	23.89	262
Difficulty			
Group 1	66.61	21.86	159
Group 2	57.86	25.87	80
Group 3	51.48	24.72	23
Total	62.61	23.89	262
Cohesiveness			
Group 1	61.45	22.78	38
Group 2	65.74	22.62	111
Group 3	59.93	25.28	113
Total	62.61	23.89	262

Note. Dependent Variable: Stanford Achievement Mathematics Test Scores

Furthermore, according to the multiple regression analysis, the combination of the five subscales of the MCI had a low positive correlation with mathematics achievement (r = .324) and accounted for only 10.5% of the variance between the independent variables and the dependent variable. The ANOVA, however, revealed a couple of statistically significant findings and relationships (Table 6). The subscales of friction and difficulty indicated significance levels of .006 and .002. According to the results of the ANOVA, there appears to be a statistically significant relationship between students' perceptions of the classroom climate, as measured by the friction and difficulty subscales of the My Class Inventory, and mathematics achievement, as measured by the Stanford Achievement Mathematics Test. Therefore, the null hypothesis must be rejected for these two subscales of classroom climate

Table 6

ANOVA: My Class Inventory Subscales

Independent Variable	Sum of Squares	Df	Mean Square	F	Sig.
Satisfaction	689.199	2	344.600	.602	.549
Friction	5866.242	2	2933.121	5.308	.006
Competitiveness	258.639	2	129.320	.225	.798
Difficulty	7197.240	2	3598.620	6.574	.002
Cohesiveness	1950.038	2	975.019	1.718	.182

Note. Dependent Variable: Stanford Achievement Mathematics Test Scores

Research Question Two

What is the relationship between student's perceptions of cohesiveness and mathematics achievement? As stated in the null hypothesis, there is no relationship between students' perceptions of cohesiveness and mathematics achievement. Table 2 revealed a correlation of -.026 between the My Class Inventory scale of cohesiveness and the Stanford Achievement Mathematics Test scores. A correlation of -.026 represented a very low negative relationship between the two variables. The ANOVA revealed an F value of 1.718 (Table 6). This value was not significant at the .01 level. Therefore, this study indicates that there is no statistically significant relationship between students' perceptions of cohesiveness, as measured by the My Class Inventory, and mathematics achievement, as measured by the Stanford Achievement Mathematics Test. The null hypothesis must be accepted.

Anderson's (1970) findings contradicted these results, however. His study suggested that the classroom climate does have a significant affect on learning. Moos (1974) also showed results that would indicate a relationship between cohesiveness and academic achievement. Montoya and Brown (1990) examined this same subscale of the MCI. Their findings revealed that elementary and middle school perceptions of cohesiveness and total battery achievement test scores were significantly and positively correlated, but a later study by Deng (1992) produced results that indicated that no such correlation exists.

Research Question Three

What is the relationship between student's perceptions of friction and mathematics achievement? According to the null hypothesis, there is no relationship between students'

perceptions of friction and mathematics achievement. Table 2 revealed a correlation of -.186 between the My Class Inventory scale of friction and the Stanford Achievement Mathematics Test scores. A correlation of -.186 represented a low negative relationship between the two variables. After completing the ANOVA, however, findings revealed an F value of 5.308 (Table 7). This value was significant at the alpha level of .01. Based on post hoc multiple comparison tests, results indicated a statistically significant level (.005) between Group 2 and Group 3 of the subscale of friction using the Tukey/Kramer (Gall et al., 1996) method (Table 8). In other words, significance was found between moderate levels of friction and high levels of friction. Students who perceived the classroom climate as moderate in the area of friction scored significantly higher on the Stanford Achievement Mathematics Test than students who perceived the classroom climate as high in the area of friction. Therefore, this study indicates there is a statistically significant relationship between students' perceptions of friction, as measured by the My Class Inventory, and mathematics achievement, as measured by the Stanford Achievement Mathematics Test. The null hypothesis must be rejected. Fraser, et al. (1982) found the amount of friction in a classroom has a significant impact on the classroom climate. Chavez and Cardenas (1980) found the lower degree of friction perceived, the higher the student's level of achievement. Other researchers agreed (Walberg & Haertel, 1980). International studies also confirmed a relationship between friction and student achievement (Chatiyanonda, 1978). Anderson's research (1970), however, indicated a positive, rather than a negative, relationship between extremes of friction and achievement gains.

Table 7

ANOVA: Friction

Independent Variable	Sum of Squares	Df	Mean Square	F	Sig.
Friction	5866.242	2	2933.121	5.308	.006

Note. Dependent Variable: Stanford Achievement Mathematics Test Scores

Table 8

Post Hoc Test: Friction – Tukey Honestly Significant Difference (HSD)

Friction (I)	Friction (J)	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound[a]	Upper Bound[a]
Group 1	Group 2	.42	4.42	.995	-12.45	13.28
	Group 3	10.68	4.78	.066	-3.25	24.62
Group 2	Group 1	-.42	4.42	.995	-13.28	12.45
	Group 3	10.26	3.29	.005	.69	19.84
Group 3	Group 1	-10.68	4.78	.066	-24.62	3.25
	Group 2	-10.26	3.29	.005	-19.84	-.69

[a]99% Confidence Interval

Research Question Four

What is the relationship between students' perceptions of satisfaction and mathematics achievement? As stated in the null hypothesis, there is no relationship between students' perceptions of satisfaction and mathematics achievement. The correlation coefficients analysis in Table 2 included a positive correlation of .058

between the My Class Inventory scale of satisfaction and the Stanford Achievement Mathematics Test scores. A correlation of .058 represented a very low positive relationship between the two variables. Results of the ANOVA revealed an F value of .602 (Table 6). This value was not significant at the .01 level. Therefore, this study indicates there is no statistically significant relationship between students' perceptions of satisfaction, as measured by the My Class Inventory, and mathematics achievement, as measured by the Stanford Achievement Mathematics Test. This researcher must accept the null hypothesis, but others would disagree. MacIntosh (1991) felt that positive social climates and learning outcomes went hand in hand. White (1968), Fraser and Fisher (1983), and Wren (1992) all confirmed a significant relationship between satisfaction and student achievement, but Anderson (1970) and Slonaker (1979) found no significant relationship in this area.

Research Question Five

What is the relationship between student's perceptions of competitiveness and mathematics achievement? According to the null hypothesis, there is no relationship between students' perceptions of competitiveness and mathematics achievement. Table 2 revealed a negative correlation of -.026 between the My Class Inventory scale of competitiveness and the Stanford Achievement Mathematics Test scores. A correlation of -.026 represented a very low negative relationship between the two variables. Results of the ANOVA revealed an F value of .225 (Table 6). This value was not significant at the .01 level. Therefore, this study indicates there is no statistically significant relationship between students' perceptions of competitiveness, as measured by the My Class Inventory, and mathematics achievement, as measured by the Stanford

Achievement Mathematics Test. The null hypothesis must be accepted. Paradise (1994) reported differing results. His study found that when students' psychosocial needs were met, they performed better academically, and in competitive classrooms students were prevented from performing well. Talmage and Walberg (1978) found that the higher the competitiveness perceived by students, the lower the students' achievement scores. Fisher and Fraser (1980) confirmed these findings. Using the My Class Inventory among a sample of 2,305 twelve year olds in Australia, competition accounted for a significant amount of learning outcome variance.

Slonaker (1979) investigated the relationship between the classroom environment and reading achievement of sixth grade students using the Otis-Lennon Mental Ability Test, the Science Research Associates Assessment Survey, and the My Class Inventory. Results of her study indicated that competitiveness was not a statistically significant predictor of reading gains.

Research Question Six

What is the relationship between students' perceptions of difficulty and mathematics achievement? As stated in the null hypothesis, there is no relationship between student's perceptions of difficulty and mathematics achievement. As a result of the correlation coefficient analysis, Table 2 revealed a low negative correlation of -.246 between the My Class Inventory scale of difficulty and the Stanford Achievement Mathematics Test scores. A correlation of -.246 represented a low negative relationship between the two variables. The ANOVA, however, revealed an F value of 6.574 (Table 9). This was significant at the .01 level. Based on post hoc multiple comparison tests, results indicated a statistically significant level at .01 between Group 1 and Group 3

of difficulty using the Tukey/Kramer (Gall et al., 1996) method (Table 10). In other words, significance was found between low levels of difficulty and high levels of

Table 9

ANOVA: Difficulty

Independent Variable	Sum of Squares	Df	Mean Square	F	Sig.
Difficulty	7197.240	2	3598.620	6.574	.002

Note. Dependent Variable: Stanford Achievement Mathematics Test Scores

Table 10

Post Hoc Test: Difficulty – Tukey Honestly Significant Difference (HSD)

Difficulty (I)	Difficulty (J)	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound[a]	Upper Bound[a]
Group 1	Group 2	8.75	3.21	.018	-.60	18.09
	Group 3	15.13	5.22	.010	-7.50E-02	30.34
Group 2	Group 1	-8.75	3.21	.018	-18.09	.60
	Group 3	6.38	5.54	.481	-9.74	22.51
Group 3	Group 1	-15.13	5.22	.010	-30.34	7.50E-02
	Group 2	-6.38	5.54	.481	-22.51	9.74

[a]99% Confidence Interval

difficulty. Students who perceived the classroom climate as having low levels of difficulty scored significantly higher on the mathematics test than students who perceived the classroom climate as having high levels of difficulty. Therefore, this study indicates

there is a relationship between students' perceptions of difficulty, as measured by the My Class Inventory, and mathematics achievement, as measured by the Stanford Achievement Mathematics Test. Consequently, the null hypothesis must be rejected. Research in the subscale of difficulty has been somewhat limited. Lepper and Hodell (1989) described challenge as a factor that should be embedded in the structure and design of all learning tasks. Walberg and Greenberg (1997) reported that students who rated their classrooms high on challenge achieved more academically. Slonaker (1979) disagreed. Her study indicated a negative relationship between the climate factor of difficulty as it related to achievement levels, and Anderson (1970) found no significant relationship. Research results in the area of difficulty remain inconclusive.

Research Question Seven

What is the relationship between students' socioeconomic status and mathematics achievement? As stated in the null hypothesis, there is no relationship between student socioeconomic status and mathematics achievement. To examine this relationship, a univariate analysis of variance was used to compare the dependent variable of Stanford Achievement Mathematics Test scores to socioeconomic status and gender. Post hoc tests were not performed for economic status because at least one group had fewer than two cases. Descriptive statistics may be viewed in Table 11. This table illustrates that generally, as socioeconomic status rose, Stanford Achievement Mathematics Test scores also rose. A dramatic increase was indicated between economic categories one and two and also between categories five and six. It should be noted, however, that the response in category six was limited to only one student. Results in Table 12 indicated significant differences ($p < .01$) in Stanford Achievement Mathematics Test scores between

Table 11

Descriptive Statistics: Socioeconomic Status and Gender

Socioeconomic Level	Gender	Mean	Standard Deviation	N
Below $20,000	male	49.38	28.49	16
	female	46.83	23.35	18
	Total	48.03	25.52	34
$20,000 to $39,000	male	65.63	22.63	19
	female	65.82	22.80	38
	Total	65.75	22.54	57
$40,000 to $59,000	male	60.76	25.67	17
	female	61.08	23.09	25
	Total	60.95	23.86	42
$60,000 to $79,000	male	67.71	23.08	14
	female	69.54	18.54	13
	Total	68.59	20.63	27
$80,000 to $99,000	male	65.14	27.19	7
	female	63.43	27.37	7
	Total	64.29	26.23	14
$100,000 to $150,000	male	75.0	-	1
	female	89.0	-	1
	Total	82.0	9.9	2
Over $150,000	male	81.00	-	1
	female	-	-	0
	Total	81.00	-	1
Total	male	61.73	25.25	75
	female	61.84	23.57	102
	Total	61.80	24.22	177

Note. Dependent Variable: Stanford Achievement Mathematics Test Scores

Table 12

ANOVA: Socioeconomic Status and Gender

Source	Type III Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
Economic	9724.677	6	1620.779	2.852	.01
Gender	53.346	1	53.346	.094	.760

Dependent Variable: Stanford Achievement Mathematics Test Scores

economic groups. This table indicated an F value of 2.852 ($p < .01$) between socioeconomic status and student achievement. As a result, the null hypothesis must be rejected. Edmonds, et al. (1977) would disagree, but the results of this study tend to confirm some of the earlier findings of Coleman, et al. (1966). Regarding gender, further results from the current study indicated no significant relationship was found ($F = .094$; $p > .01$) between this independent variable and mathematics achievement in this particular sample.

Summary

Classroom climate factors were hypothesized to correlate with student achievement in mathematics. The data presented in this chapter supported such a correlation for the subscales of friction and difficulty. Results also indicated that Stanford Achievement math scores varied significantly as a function of economic category membership. The above data analyses presented evidence on which to accept or reject the stated null hypotheses as related to the full group model and each independent variable. Additionally, a summary of a backward solution analysis presented evidence to establish the best predictor variables for the full group model and each independent variable.

Finally, the results of a univariate analysis of variance presented evidence on which to accept or reject the stated null hypothesis regarding mathematics achievement, including the five subscales of the My Class Inventory, socioeconomic status, and gender.

CHAPTER 5

CONCLUSIONS, RECOMMENDATIONS, AND SUMMARY

Conclusions

Purpose and Design

The purpose of the study was to measure the relationship between classroom climate and student achievement. The concept of personal variables interacting with environmental variables in influencing behavior originated with Murray (1938). Since that time investigation has continued contributing to the knowledge in this area. This particular study was an attempt to provide more specific information regarding classroom climate and student achievement. In this study, perception of the classroom climate was determined by the My Class Inventory (MCI) and its five subscales of satisfaction, friction, cohesiveness, difficulty, and competitiveness. The total mathematics score of the Stanford Achievement Test was used as the dependent variable. The researcher also looked at the independent variables of socioeconomic status and gender.

The sample consisted of 11 teachers and 262 students in sixth grade mathematics classes. This study used a volunteer sample from a suburban community in Texas with a population of approximately 100,000 residents. The study was a quantitative correlational design. A Pearson product-moment correlation coefficient was used to analyze data related to the research questions. The researcher used a multiple regression analysis, including a backward solution. A univariate analysis of variance was also used to determine whether or not changes in mathematics achievement were presumed to be the

result of the My Class Inventory subscales, socioeconomic status, or gender. The analysis used the Statistical Package Software System (SPSS).

Implications

The results of this study have potential implications for all schools, classrooms, and educators. Determining which climates are the most suitable for a positive impact on student achievement is critical. Research on the classroom environment for the past three decades confirms that the environment may affect student outcomes, but many questions about how climate affects students remain unanswered. The purpose of this study was to increase what is known about classroom climate by investigating the relationship between students' perceptions of the classroom climate and its impact on student achievement. The results of this study indicated that:

1. Classroom climate, as measured by the My Class Inventory (MCI) – including cohesiveness, friction, satisfaction, competitiveness, and difficulty – showed a significant relationship to mathematics achievement as measured by the total mathematics scores on the Stanford Achievement Mathematics Test under Analysis of Variance (ANOVA) in the classroom climate subscale areas of friction and difficulty.
2. Both positive and negative results were indicated among the subscales of the MCI according to Pearson product-moment correlation coefficient analysis, but these occurred with only low levels of correlation. The multiple regression analysis indicated a low positive correlation ($r = .324$), and combined indicators accounted for 10.5% of variance. The univariate analysis of variance indicated significant relationships in the areas of friction ($p < .01$) and difficulty ($p < .01$). The other three subscales of the MCI indicated little,

if any, relationship between these classroom climate subscales and mathematics achievement.

3. There was a positive relationship between students' socioeconomic status, as indicated on the student survey form, and mathematics achievement, as indicated by the total mathematics scores on the Stanford Achievement Test.

This study produced some surprising results compared to previous research. There was a failure of all of the My Class Inventory subscales to show a moderate or large positive relationship between classroom climate and Stanford math scores through Pearson product-moment correlation coefficient and regression analyses. The subscales of the MCI indicated only 10.5% of the variance resulted from the multiple regression analysis. The remaining 89.5% could possibly be attributed to other factors such as innovative teaching, experience of the teacher, selection of the curriculum, length of class, time on task, importance placed on the Stanford Achievement Mathematics Test and MCI, and prior knowledge. The univariate analysis of variance, however, indicated significant relationships in both friction and difficulty at a significance level of .01.

Why do some of the results of this study contradict and some results support the findings of many other researchers? One possible rationalization deals with the unusual nature of the sample in this study. Student achievement results revealed a sample with an above-average mean score of 62.6%, while the average mean on the Stanford Achievement Mathematics Test was 50%. Researchers from the Center for Research on the Context of Secondary School Teaching offered one possible explanation (Phelan, Davidson, & Hanh, 1992). Working with a sample of 54 students, mostly in their first year of high school, these researchers followed the students for a 2-year period. The team conducted intensive interviews, classroom observations, and analyses of student records.

Their research findings indicated that high-achieving students so thoroughly internalized goals for themselves that they overlooked, ignored, or rationalized classroom circumstances that were not optimal. Working toward these internalized goals took precedence over any discomfort they may have felt in a particular class. In other words, perhaps the high-achievers in the sample from this study were not as easily affected by classroom climate. Perhaps they, too, were driven by their own goals rather than responding to their own environment.

Another possibility for contradictory results between researchers involves high-stakes testing. Brandt (1989) defines high-stakes testing as "standardized achievement tests, used as direct measures of accountability for students, educators, schools, or school districts with significant sanctions or rewards attached to test results" (p. 26). The single greatest criticism of high-stakes tests is that they inevitably lead to teaching to the test. In addition, gains in scores may be attributed merely to test-taking skills. While this may improve performance, it may also inflate the estimate of achievement (Gordon & Reese, 1997).

Texas is a state with a considerable amount of high-stakes testing. The Texas Assessment of Acdemic Skills (TAAS) is a classic example. Based primarily on the percentage of students passing each of the subjects tested, schools are placed into one of four categories: exemplary, recognized, acceptable, or low performing. Schools rated as exemplary or recognized automatically qualify for monetary awards. Campuses which are rated academically acceptable and have shown significant gains on TAAS are also eligible for cash awards. Schools rated as low performing for 2 consecutive years face sanctions and interventions from the Texas Education Agency (Gordon & Reese, 1997).

Perhaps the surprisingly high Stanford scores from the sample in this study were the result of high-stakes testing. Koretz (1991) examined third graders from a high-poverty urban district with an enrollment of 90% minority students. The district used unmodified commercial achievement tests for its testing program, which was perceived as high-stakes. Results of Koretz's study indicated that performance on conventional high-stakes tests did not generalize well to other tests. His research offered one possible explanation why the Stanford scores in this district of high-stakes testing may not have generalized well when compared to the scores of the My Class Inventory in this particular study.

Herrick's (1999) study used state-level scores from the National Assessment of Educational Progress (NAEP) to evaluate whether state level performance assessments have shown evidence of having a positive impact on classrooms, resulting in higher levels of student achievement. Tests included fourth grade reading and math and eighth grade math. Comparisons of NAEP state scores between performance assessment states and other states – including Indiana, Kansas, Kentucky, Maine, Maryland, New Hampshire, North Carolina, Rhode Island, and Vermont – were investigated using several statistical methods. According to Herrick's findings, higher achievement levels were associated with state-level performance assessment. Perhaps it is true that the high Stanford Achievement Mathematics Test scores of the sample are a result of the extremely high-stakes testing in Texas. If Stanford Achievement Mathematics Test scores are skewed, perhaps the results of this entire study are also affected.

There is yet another possible explanation regarding the surprising results of this study. Some researchers question the validity of the entire effective schools movement, including the correlate of climate. Lee, et al. (1996) stated much of the effective schools

research is weak in its theoretical base. Anderson's (1982) thorough review of the school climate literature was also quite critical. She contended that such research has used a variety of causal models (often inconsistent with one another or even internally inconsistent), inadequate research designs, and improper statistical analysis, often resulting in misinterpretation.

Makedon's 1992 study examined the effectiveness of schools in closing the academic achievement gap between low and middle socioeconomic status (SES) students in grades K-12. He argued that the schools which had been identified as effective did not close the gap without lowering the average academic achievement of mid-SES students. He further reported that according to Good and Brophy (as cited in Makedon, 1992), there has been a relative instability of effective schools (only 5% remained effective over a period of 3 years). Makedon's study indicated that schools identified as effective did not overcome the influence of student social class, let alone close the academic achievement gap between low and mid-SES students.

Sabatella uncovered rather surprising results during his 1992 study involving correlates, climate, and achievement. He investigated 140 New York State public elementary and secondary schools to determine the extent to which teachers' perceptions of the existence of effective schools correlates were associated with student achievement when student background variables were used as controls. Eleven effective school correlates were identified, including school climate. Findings suggested that all 11 correlates measured a constant defined as school ethos or climate, but no significant relationship could be found between the correlates and student achievement above predictions based on student background. Sabatella suggested that climate or ethos was the wrong phenomenon to be considered in the school improvement process.

If the effective schools movement did, in fact, fail to identify effective schools, much less determine effective school correlates, then climate also comes into question. What, then, is the importance of climate and its relationship with academic achievement? If effective schools research has a weak theoretical basis, as suggested by Lee, et al. (1996), then educational research in the area of classroom climate is of great importance. Yet, after completing the multiple regression analysis in this study, the researcher was surprised that results indicated there was only a low positive correlation between classroom climate (all subscales combined) and student achievement. After completing this study, the researcher contacted the author of the My Class Inventory, Dr. Barry Fraser, and asked for help in understanding and interpreting the unanticipated results. Dr. Fraser's e-mail response confirmed what has been suggested earlier in this chapter:

> To get correlations of a decent size, you need variability – high and low achievers and classrooms with positive and negative climates. Relative uniformity could explain your small correlations. The signs of your correlations look to be in the anticipated direction mostly. Your sample is not big. A bigger sample is likely to give you more variability and to allow you to calculate correlations using the class mean as the unit of analysis. Both would lead to higher correlations. (Personal communication, July 11, 2001)

It was interesting to note that the two subscales with significant results, friction and difficulty, had more variability in scores, just as Dr. Fraser had suggested.

In addition to Dr. Fraser's interpretation of the findings of this study, the importance of the analysis of variance cannot be overemphasized. Most of the research mentioned in previous studies employed a multiple regression analysis, but the results of the multiple regression analysis in this study showed only a low positive correlation between classroom climate and mathematics achievement with only 10.5% of the variance on math achievement accounted for by classroom climate. The analysis of variance revealed a significant positive correlation between the climate of the classroom

and that of mathematics achievement. This study is important to educational research because results suggested the amount of friction and the degree of difficulty are, in fact, related to mathematics achievement. The results further suggested that educators pay careful attention to the degree of difficulty and the amount of friction in their classrooms.

In classrooms with high levels of friction, results of this study indicated that learning is significantly impeded. The same holds true for the classroom climate subscale of difficulty. When learning became too difficult, achievement was negatively impacted. This has important implications for the classroom. Educators must be cognizant of the amount of friction and the degree of difficulty their students are experiencing. They must be sensitive to the climate factors of friction and difficulty, and they must be keenly aware of the impact these two climate factors have on the ability of their students to learn. Educators must constantly strive to lower the levels of tension in the classroom. This tension could be the result of teacher-to-student, student-to-teacher, or student-to-student interactions. Educators must also be aware of the performance level of each student, and they must work to provide learning experiences for each student that will include a reasonable degree of difficulty. As soon as the level of difficulty appears to be excessive for the student, the teacher must adjust the educational experience appropriately if learning is to continue.

Recommendations

Several recommendations may prove useful in future research attempting to determine a link between the classroom environment and student achievement.

1. Longitudinal research should be conducted to determine students' perceptions of classroom climate. Perhaps a snapshot of classroom climate early in the year does not offer enough accurate data to compare with achievement test scores.

2. Random samples should be incorporated in similar studies. A larger sample with more variability would also be preferred.
3. Pre and posttests would be beneficial in future studies.
4. Similar studies should be conducted using multiple measures of climate and/or achievement.
5. Further research is needed to determine whether there is similarity between the actual environment and that preferred by the students. In addition to quantitative methods, qualitative approaches should be implemented to determine climate perceptions. This study may have been more substantial if both quantitative and qualitative measures of climate had been incorporated.
6. Both multiple regression analysis and univariate analysis of variance need to be incorporated into further research. Many studies incorporate one or the other, but not both. Therefore, results may vary.

Summary

Many teachers devote a great deal of time and attention to the establishment of an appropriate climate in their classrooms. The findings of this study indicate some subscales of the environment play a relatively minor role in influencing student achievement, while other subscales, such as friction and difficulty, appear to be major contributors. Certain findings of this study may appear to differ somewhat from those of earlier researchers, so one is left with gaps in the knowledge of the environment and its impact on achievement. The exact mechanisms by which individual and group variables interact are yet unclear, even though a large body of research still suggests a plausible relationship. According to this study, friction, difficulty, and socioeconomic status do appear to show a strong link with achievement. They continue to be factors that should

not be underestimated by educators. It should be noted, regarding levels of friction and difficulty in the classroom, that one of the oldest principles in psychology appears to apply and agree with results of this study. The Yerkes-Dodson law states:

> on tasks of moderate difficulty, increasing levels of arousal will increase performance up to a point, and then further arousal will have a detrimental effect of responding. By comparison, simple tasks can accommodate much higher levels of arousal before performance begins to fall off, and more difficult tasks require much lower levels of arousal for optimal performances. (Ludy, Hopkins, & Nation, 1990, p. 354)

In other words, a little friction and difficulty are good to a point in learning, but when friction and difficulty become excessive, learning is impaired.

Some of the results of this study have been surprising and somewhat contradictory to that of previous research, although results do support research by Anderson (1970), Slonaker (1979), and Sabatella (1992). The results of this study suggest, however, that the classroom climate factors of friction and difficulty show a significant relationship to student achievement as measured by the Stanford Achievement Mathematics test. Socioeconomic factors continue to show significance, as well. Since academic achievement is a major concern in education, clearly more investigation is warranted in the area of the classroom environment and its relationship with student achievement. There are many possible assessments and environmental variables at work in today's educational setting. It is not yet clear how the many environmental variables relate to student achievement, yet educators are expected to design physical and social systems that will facilitate learning and maximize educational growth. Further conceptualization and knowledge about environmental dimensions are essential determine the factors that have the greatest impact on student achievement.

APPENDICES

APPENDIX A

PERMISSION FOR THE USE OF THE MY CLASS INVENTORY

Permission for use of the My Class Inventory

Subj:
Date: 3/2/00 2:48:49 AM Central Standard Time
From: B.Fraser@smec.curtin.edu.au (Barry Fraser)
To: JanBennet@aol.com

Jan

1'%e received your message.

You have my permission to use the My Class Inventory in your dissertation.

I'd be glad to send some recent references if you'd care to send me your mailing address.

Best wishes

BARRY FRASER

Professor Barry Fraser
Director, Science and Mathematics Education Centre
Curtin University of Technology
Courier Address: Kent Street, Bentley, Western Australia 6102
Tel: + 61 8 9266 7896 Fax: + 618 9266 2503
email: ifraserb@in1b.curtin.edu.au
Mail: SMEC, Curtin University of Technology, GPO Box U1987, Perth, WA 6845

Headers Return-Path: <B.Fraser@smec.curtin.edu.au> Received: from dy-ydO2.mx.aol.com (rly-yd02.maiI.aoI.com [172.18.150.2]) by air-yd04.maiLaol.com (v69.17) vAth ESMTP; 'Thu, 02 Mar 2000 03:48:49 –0500 Received: from info. Curfin.edu.au (Infb.curtin.edu.au [134.7.134.222]) by r11y-yd02.mx.aoI.com "9.17) with ESMTP; Thu, 02 Mar 2000 03:48:43 –M Received: from rosalie (rosalie.curtin.edu.au [134.7.129.451) by info.curtin.edu.au (8.9.3/8.9.3) vAth SMTP id QAA16887 for <JanBennet@aol.com>; 'Thu, 2 Mar 2000 16:48:40 +0800 (WS*r) From: "Barry Fraser" <B.Fraser@smec.curtin.edu.au> To: <JanBennet@aol.com> Subject: Date: Thu, 2 Mar 2000 16:48:42 +0800 Message4D: <NDBBIFDCMMAPJB FIEPPOEMEOLCLAA.B. Fmser@sn-ec. Curt! N.edu.au> MIME-Version: 1.0 Content-Type: texVplain; chamet—"Iso-8859-1" X-Pdority: 3 (Normal) X-MSMail-Priodty: Normal X-Mailer Microsoft Outlook IMO, Build 9.0.2416 (9.0.2910.0) Importance: Normal X-MimeOLE: Produced By Microsoft MimeOLE VS.00.2314.1300

APPENDIX B

MY CLASS INVENTORY

SUPPLEMENT A

MY CLASS INVENTORY

STUDENT ACTUAL SHORT FORM

DIRECTIONS

This is not a test. The questions are to find out what your class is actually like.
Each sentence is meant to describe what your actual classroom is like. Draw a circle around

YES if you AGREE with the sentence
NO if you DON'T AGREE with the sentence.

EXAMPLE

27. Most pupils in our class are good friends.

If you agree that most pupils in the class actually are good friends, circle the Yes like this:

(Yes) No

If you don't agree that most pupils in the class actually are good friends, circle the No like this:

Yes (No)

Please answer all questions. If you change your mind about an answer, just cross it out and circle the new answer.
Don't forget to write your name and other details below.

	Remember you are describing your actual classroom	Circle Your Answer	For Teacher's Use
1.	The pupils enjoy their schoolwork in my class.	Yes No	
2.	Pupils are always fighting with each other.	Yes No	
3.	Pupils often race to see who can finish first.	Yes No	
4.	In my class the work is hard to do.	Yes No	
5.	In my class everybody is my friend.	Yes No	
6.	Some pupils are not happy in my class.	Yes No	R
7.	Some pupils in my class are mean.	Yes No	
8.	Most pupils want their work to be better than their friend's work.	Yes No	
9.	Most pupils can do their schoolwork without help.	Yes No	R
10.	Some pupils in my class are not my friends.	Yes No	R
11.	Pupils seem to like my class.	Yes No	
12.	Many pupils in my class like to fight.	Yes No	
13.	Some pupils feel bad when they don't do as well as the others.	Yes No	
14.	Only the smart pupils can do their work.	Yes No	
15.	All pupils in my class are close friends.	Yes No	
16.	Some pupils don't like my class.	Yes No	R
17.	Certain pupils always want to have their own way.	Yes No	
18.	Some pupils always try to do their work better than the others.	Yes No	
19.	Schoolwork is hard to do.	Yes No	
20.	All pupils in my class like one another.	Yes No	
21.	My class is fun.	Yes No	
22.	Pupils in my class fight a lot.	Yes No	
23.	A few pupils in my class want to be first all of the time.	Yes No	
24.	Most pupils in my class know how to do their work.	Yes No	R
25.	Pupils in my class like each other as friends.	Yes No	

For Teacher's Use Only: S--- F ---- --- Cm- D- Ch

This page is a supplement to a publication entitled Assessing and Improving Classroom Environment authored by Barry J. Fraser and published by the Key Centre for School Science and Mathematics at Curtin University.

APPENDIX C

PARENT PERMISSION FORM

Parent/Guardian Consent

I, _____ (your name), related to the subject as _____parent _____guardian agree to the participation of _____ (your child's name) in this study. I have read and understand the risks and benefits of this study. I understand that my child or I may later refuse to participate, and that my child through his/her own action or mine, may withdraw from this study at any time. I have received a copy of this consent form for my own records, and I understand that no one will know my child's individual results from this study.

_____ _____
Parent's/Guardian's Signature Date

_____ _____
Investigator's Signature Date

As one component of the survey, it would be helpful if you could provide the following information regarding family income. This information is entirely optional.

Please check the box that best indicates your family's total yearly income:

_____ less than $20,000
_____ $20,000 to $39,000
_____ $40,000 to $59,000
_____ $60,000 to $79,000
_____ $80,000 to $99,000
_____ $100,000 to $150,000
_____ over $150,000

Student Assent Form

I, _____ (your name), agree to participate in this study. I have read and understand what it is about. I understand that I may change my mind and later refuse to participate. I have received a copy of this assent form, and I understand that no one but Jan Bennett will know the answers to my questions.

_____ _____
Student Signature Date

_____ _____
Investigator's Signature Date

APPENDIX D

RAW DATA BY INDIVIDUAL STUDENTS, CLASSES, AND VARIABLES

Raw Data By Individual Students, Classes, and Variables

STUDENT	SATIS.	FRICT.	COMPET.	DIFFIC.	COHES.	ECON.	STANFORD	GENDER
C1	9	11	9	9	5		81	M
C2	15	11	11	7	9	2	71	F
C3	15	7	13	5	15	4	78	F
C4	15	9	9	7	7	4	83	M
C5	15	5	13	5	15		49	M
C6	11	9	11	9	7	2		F
C7	15	7	11	5	13	5	71	M
C8	13	7	11	7	7	3	80	M
C9	15	9	9	5	9	2	52	F
C10	13	7	11	7	13	3	85	F
C11	11	9	15	11	7	4	57	F
C12	11	7	13	5	7	3	86	F
C13	9	11	9	7	5	2	77	F
C14	14	7	13	5	7	7	81	M
C15	13	7	9	5	7	6	89	F
C16	15	7	7	5	13	2	75	F
C17	9	7	11	5	5	2	98	F
C18	11	7	15	9	9	4	61	F
C19	13	9	9	7	7		83	M
C20	13	11	13	5	7	3	97	F
C21	15	5	5	7	15		74	M
C22	15	9	15	5	15	5	91	F
C23	15	9	15	5	15	5	91	F
C24	15	7	11	5	15	6	75	M
C25	13	9	13	5	11	4	97	M
C26	15	7	13	5	15	1	93	M
C27	11	15	11	5	9	1		F
C28	13	9	11	7	11	2	88	F
C29	15	9	13	7	9	2	50	M
C30	13	5	9	5	11		78	F
C31	15	9	9	5	15	2	97	F
D1	9	9	9	5	13	1		F
D2	13	9	11	5	7	2	46	M
D3	9	7	9	13	11	3	3	M
D4	11	7	15	5	7		91	F
D5	11	15	13	5	6	3	46	F
D6	15	7	11	7	15	2	38	F
D7	11	7	13	5	11		29	M
D8	11	7	13	5	9	2	17	M
D9	13	13	15	5	15	3	44	F
D10	11	7	11	5	7	1	47	F
D11	9	9	15	5	9	1	15	F
D12	11	15	15	5	9		44	M
D13	13	9	11	5	7	1	71	F
D14	13	9	11	5	7	2	49	F
D15	15	7	11	5	13		44	F
D16	11	9	15	5	5		44	F

D17	13	7	11	5	15	2	76	F
E1	9	9	13	9	5	2	19	F
E2	15	7	11	7	15	1	58	F
E3	9	9	15	9	9	1	69	M
E4	11	7	11	5	11	3	92	M
E5	9	9	15	7	7		53	F
E6	8	11	13	11	9	1	69	M
E7	11	11	11	7	5	1	26	F
E8	7	9	13	7	9	1		F
E9	13	5	15	5	11	3	71	M
E10	11	9	13	7	5	4	62	F
E11	11	9	13	5	15	4	84	F
E12	11	9	15	5	7		69	F
E13	9	15	15	9	11	1	13	F
E14	13	9	11	7	11		66	F
E15	13	15	13	7	11	5	20	M
E16	9	11	15	5	7	3	66	F
E17	11	15	15	9	9	2	88	M
E18	7	15	15	11	7		31	M
E19	7	15	13	7	11	1	59	M
E20	15	11	13	5	7	1	90	F
E21	7	13	13	7	11			F
E22	5	15	7	13	7	1	67	F
E23	5	15	11	5	7		96	M
E24	7	15	13	7	9			F
E25	11	13	9	5	9	1	71	F
E26	13	11	7	7	7	3		M
E27	13	15	13	5	7	1	10	F
E28	5	15	9	11	5		71	M
E29	13	11	11	5	7	3	64	M
E30	5	5	9	13	5			M
E31	7	9	11	9	5	3	69	F
E32	11	13	9	11	7		62	F
E33	7	13	11	5	9		48	F
E34	9	15	15	7	5	2	91	M
F1	15	11	11	5	15	4	57	F
F2	13	7	11	5	15			F
F3	11	13	7	9	15	2	19	M
F4	15	9	13	9	11	4	54	F
F5	7	5	11	5	13	2	35	F
F6	7	11	13	9	5	2	71	F
F7	7	11	13	5	11		15	F
F8	9	7	11	5	5		62	M
F9	13	7	13	5	11		59	F
F10	9	9	11	5	7	2	89	F
F11	11	9	11	5	13			M
F12	15	9	13	5	7	2	81	F
F13	5	9	11	11	5	2	56	F
F14	11	9	7	5	11	2	21	F
F15	11	7	13	7	5	6		M
F16	5	9	13	5	7	3	22	M

F17	13	9	11	5	7	5	48	M
F18	7	11	11	9	11	3	44	M
F19	9	10	13	7	8	5	68	F
F20	13	7	11	5	11	5	77	F
F21	9	11	15	13	5		12	F
F22	11	9	13	5	13	5	64	M
F23	7	9	13	7	7		74	M
F24	5	7	13	13	9	4	41	M
F25	7	9	7	5	7	3	52	F
F26	7	11	11	9	11	2	10	F
F27	13	7	11	5	9	4	70	F
F28	15	7	9	9	15	5	14	F
F29	9	9	6	5	5		56	M
F30	9	9	11	5	9	2	74	F
F31	9	11	15	5	5			F
F32	10	7	13	7	11	2	53	M
F33	15	5	7	5	15	2		F
F34	10	8	14	6	12			F
F35	5	7	15	5	5	4	74	M
F36	13	7	13	5	9	3	39	M
F37	7	7	15	6	10	3	83	M
F38	9	15	13	9	11	3	31	F
F39	5	9	9	5	7		62	F
F40	15	5	7	7	10	3	61	M
F41	9	6	11	7	8	2	84	F
F42	11	9	15	7	7	1		M
F43	10	9	13	5	8	4	90	M
F44	8	9	11	7	6	2	78	F
F45	13	5	9	5	15	2	76	F
F46	9	7	9	5	15	1	45	M
F47	7	9	11	9	11	3		M
F48	6	7	15	7	5	3	67	M
F49	13	9	12	7	15	3	8	F
G1	9	7	13	5	9	2	64	M
G2	9	9	13	5	9		50	M
G3	7	15	15	11	9	1	6	M
G4	13	7	9	5	7	1	24	M
G5	13	5	13	9	7	3		F
G6	15	9	9	5	7	3	95	
G7	15	5	5	9	15			M
G8	13	7	11	5	5		79	F
G9	13	9	15	5	9		84	F
G10	15	7	7	9	5	3	28	M
G11	7	11	13	9	5	2	87	M
G12	13	5	5	11	13	1	72	M
G13	5	7	11	11	7		93	M
G14	11	5	11	5	7		81	M
G15	11	7	5	5	5		83	M
G16	15	5	11	5	7		74	M
G17	11	9	11	11	7		82	M
G18	11	7	11	5	9	4	95	M

G19	5	11	9	5	9		47	F
G20	13	9	5	5	11		58	M
G21	11	9	11	5	7	3	81	M
G22	9	7	7	5	7		90	M
G23	5	9	5	7	7	5	47	F
G24	11	7	11	7	13		72	M
G25	9	13	11	7	5	2	76	F
G26	13	7	7	5	11	3	33	F
G27	7	7	5	7	15		69	M
G28	9	9	7	7	7		98	M
G29	7	9	15	7	7	3		M
G30	13	5	13	5	11	3	69	F
H1	15	5	11	5	15		82	F
H2	11	11	11	5	12		48	F
H3	11	9	7	7	9	2	83	F
H4	15	11	9	11	11	1	29	F
H5	9	9	7	5	5	1	60	M
H6	9	13	15	5	8	2		F
H7	11	9	9	5	9	2	78	F
H8	9	15	15	9	11			F
H9	11	9	11	5	7	5	98	M
H10	9	7	9	9	7		71	M
H11	15	7	7	5	13	5		M
H12	13	7	11	7	13	2	41	F
H13	7	9	13	5	7	4	78	M
H14	11	5	7	5	13	3	73	F
H15	15	5	5	5	11		80	M
H16	11	9	9	5	9	3	87	F
I1	7	7	9	5	15	4	90	F
I2	15	5	7	5	13	4	92	F
I3	11	11	13	5	11	2	64	M
I4	13	5	7	5	15	4	74	M
I5	9	15	7	5	5	2	50	F
I6	13	5	9	11	13		69	F
I7	11	9	15	11	9		33	F
I8	13	13	11	5	5	4	40	M
I9	9	7	13	5	15	3	85	F
I10	13	7	15	5	11	4	86	F
I11	9	13	13	5	7	5	96	M
I12	11	9	15	5	15	1	55	F
I13	13	11	9	5	7	2	89	M
I14	11	9	5	5	7	3	63	F
I15	11	13	9	5	11	3	81	M
J1	11	15	11	7	5	1	81	M
J2	11	11	11	7	5	3	87	F
J3	15	5	5	5	13		64	M
J4	15	5	11	5	9		89	F
J5	11	9	15	5	5	4	93	M
K1	9	11	13	7	7		74	F
K2	11	5	5	5	15	2	88	M
K3	7	9	13	9	7	2	51	M

K4	11	9	11	5	9	3	75	M
K5	13	15	13	7	5	3	26	F
K6	11	7	7	5	11		56	M
K7	15	11	11	7	13		5	M
K8	9	11	15	11	5		65	F
K9	13	7	7		13	2	66	M
K10	7	9	15	11	7	5	56	F
K11	11	5	11	5	7	2	80	F
K12	11	7	13	5	13	3	89	M
K13	15	7	13	9	13	3	53	F
K14	9	5	13	5	11		92	M
K15	7	9	13	9	7	2	47	F
K16	9	11	11	5	7		56	M
K17	11	9	15	5	11	2	59	M
K18	13	11	11	5	13	2	67	M
K19	13	5	11	7	13	2	78	M
K20	9	15	11	5	5		73	F
K21	11	11	11	9	13	1	8	M
K22	9	11	13	5	9		57	M
K23	11	13	15	9	13	2	77	F
K24	13	5	11	7	13	3	53	M
K25	7	13	9	5	13	2	85	F
K26	9	11	11	9	9	2	34	F
K27	13	7	13	5	7	2	92	F
K28	13	5	9	7	11		14	M
K29	11	5	15	5	13		96	F
L1	15	7	11	5	15	1	86	M
L2	13	7	13	5	15	3	79	F
L3	13	7	9	5	13	2	93	F
L4	7	7	15	15	5	2	69	F
L5	15	7	5	5	15		96	F
L6	13	5	7	5	15		58	F
L7	15	7	5	5	15	2	79	M
L8	13	7	7	5	15		80	F
L9	15	7	7	5	15	4	85	F
L10	11	9	7	7	13		86	M
L11	11	13	11	5	9	2	50	F
L12	11	5	9	5	11	2		F
L13	15	7	7	5	15	3	35	F
L14	7	7	11	5	11	1	49	F
L15	11	13	13	5	7		64	M
L16	13	13	15	9	13	1		F
L17	13	7	5	5	13		16	M
L18	13	15	9	5	13	4	38	M
L19	11	15	10	5	5		60	F
L20	13	5	9	5	15	3	46	F
L21	13	9	9	5	7		80	F
L22	13	9	9	5	11	2	75	F
L23	13	9	11	5	15	1	63	F
L24	13	9	13	5	15		79	F
L25	13	5	11	5	11	3	66	F

L26	15	9	11	5	15	0	60	F
L27	9	5	13	5	9		76	M
L28	11	5	7	5	15		48	F
M1	15	9	9	7	11		63	F
M2	13	7	11	5	15	1	19	F
M3	13	9	7	5	9		84	F
M4	11	9	9	7	13		29	F
M5	15	7	9	5	11		95	F
M6	9	9	11	5	5		64	M
M7	11	15	13	9	9		91	M
M8	13	11	11	5	15	1	10	M
M9	15	5	11	7	15	4	35	M
M10	13	5	5	5	13	4	57	M
M11	11	9	13	7	11	4	28	F
M12	5	9	15	9	7		87	F
M13	15	7	15	5	13		51	M
M14	11	5	5	5	7	4	53	M
M15	7	9	13	5	7	2	91	M
M16	11	15	15	5	11	1	65	F
M17	15	5	7	9	9			F
M18	5	9	15	11	7	2	56	F
M19	5	13	13	5	7	1	47	F
M20	11	15	15	11	5		18	M
M21	7	15	13	11	7		63	F
M22	5	9	13	9	9		96	M
M23	9	11	13	9	9	3	82	F
M24	9	5	7	9	7		8	F
M25	8	15	15	13	5		33	F
M26	5	9	9	5	9	1	31	M
M27	13	9	9	5	7	1	33	M
M28	5	13	11	9	5		80	F
M29	11	13	15	5	5	3	59	F
M30	13	13	7	7	9	5	59	M
M31	7	15	13	7	11		69	F
M32	7	15	11	5	5	1	48	F
M33	13	13	7	7	7	1	44	M

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