A CASE STUDY OF AN EFFECTIVE MIDDLE SCHOOL ALGEBRA I TEACHER

by

Patricia Lorraine Curtis Linton

A dissertation submitted to the faculty of
The University of North Carolina at Charlotte
In partial fulfillment of the requirements
For the degree of Doctor of Philosophy in
Curriculum and Instruction

Charlotte

2011

Approved by:

_____
Dr. David K. Pugalee

_____
Dr. Corey Lock

_____
Dr. Chuang Wang

_____
Dr. Eric Heggestad

ABSTRACT

PATRICIA LORRAINE CURTIS LINTON. A case study of an effective middle school Algebra I teacher. (Under the direction of DR. DAVID K. PUGALEE

Using a qualitative case study approach, this research explored the perceptions of middle school students on the role of their mathematics teacher in their success or failure to achieve in his mathematics classroom. Also, the study examined the teacher's perceptions of his role in the students' achievement. Further, the research explored the teacher's strategies while teaching Algebra I. Through the use of 135 hours of classroom observations, student interviews, teacher interviews, and field notes, the following teacher strategies were supported: the use of routine, extensive modeling, scaffolding, differentiation, real life examples, and strong encouragement. Achievement data and end-of-course assessments confirmed that this low-performing, high-poverty middle school had 100% pass rates on the state Algebra I end of course test.

ACKNOWLEDGEMENTS

David K. Pugalee, my chair, without whom I would not have enrolled in the university to seek this degree and will remember forever as my motivator. His many countless hours of reading and advising can never be repaid in a simple acknowledgement. I would also like to thank Dr. Corey Lock, Dr. Chuang Wang, and Dr. Eric Heggestad for serving on my committee. These gentlemen also encouraged me with suggestions that made this work possible. This acknowledgement must include Chris Harrington, Dr. Tyre Trez and Anita Smith for great patience in editing my manuscript.

Thank you to the teacher referred to in this dissertation as Mr. Jones. You have motivated many students in your Algebra I for high school credit class. You were responsible for one young man's motivation to continue to the university and graduate with honors. He calls you his hero. I call you more than hero, but Teacher and all that it should mean.

This is dedicated to the heroes of my life: my family, my teachers, and my professors. Each of you contributed to my motivation to succeed. Over many years as a school counselor I have watched countless students smile at the memory of their teachers. What a tremendous gift you give each day. What a profound influence you wield on the lives of so many students and their parents.

TABLE OF CONTENTS

CHAPTER I: INTRODUCTION 1

Statement of the Problem 1

Research Questions 6

Significance of the Study 6

Definitions 8

Summary 9

CHAPTER II: LITERATURE REVIEW 11

Theoretical Framework 11

Motivational Theories 16

Goal Orientation 17

Mastery Goals 18

Social Goal Orientation 20

Self-Determination Theory 23

Teacher Effectiveness 28

Student Motivation Tied to Achievement Outcomes 32

Teacher and Student Relationships 33

Summary 36

CHAPTER III: METHODOLOGY 38

Definitions 40

Setting 41

Student Participants 47

Teacher Participant 47

Role of the Researcher 48

Data Collection 49

Observations 53

Student Interviews 56

Teacher Interviews 58

Field Notes 60

Data Analysis 63

Summary 67

CHAPTER IV: RESULTS 70

Research Question 1 71

Scaffolding 72

Modeling 74

Real-life Problem Solving 77

Differentiation 80

Research Question 2 81

Research Question 3 84

Summary 89

CHAPTER V: DISCUSSION 92

Observations 93

Teacher Interviews 94

Student Interviews 95

Field Notes 97

Conclusions 100

REFERENCES 103

APPENDIX A: SUMMARY OF IDENTIFIABLE PATTERNS FROM FIELD NOTES 116

APPENDIX B: FIELD NOTES OF A TYPICAL DAY 121

APPENDIX C: QUESTIONS FOR STUDENT OPEN-ENDED INTERVIEWS 126

APPENDIX D: INTERVIEW QUESTIONS FOR MR. JONES 127

APPENDIX E: FOLLOW-UP QUESTIONS FOR STUDENTS 128

APPENDIX F: THE CLASSROOM LAYOUT OF MR. JONES 130

LIST OF TABLES

TABLE 1: Two goal orientations and approach and avoidance 19

TABLE 2: Summary of characteristics associated with more Effective teachers 31

TABLE 3: North Carolina standard course of study for Algebra I 43

TABLE 4: Students' key words and phrases illustrative of Scaffolding 71

TABLE 5: Solution modeling reported by students 76

TABLE 6: Observations of cognitive teacher modeling 76

TABLE 7: Careers students listed as of future interest 79

TABLE 8: Teacher strategies in the classroom 84

CHAPTER I: INTRODUCTION

Motivation is essential to student learning and achievement in mathematics (Elliot & Dweck, 2005), and students agree on that importance (Middleton & Spanias, 1999). However, student motivation toward higher level mathematics waivers as they reach middle school and may impact college entrance (Middleton & Spanias, 1999). The purpose of this study was to describe the attitudes and reports of the students and teacher concerning the factors that influence student achievement in the middle school mathematics classroom. Using qualitative methods, this study was designed to provide information for educators regarding classroom practices and teacher behaviors linked to student achievement.

This chapter provides background information for the study. This includes the problem, research questions, and conceptual framework as well as an overview of the methodology, assumptions, delimitations, and limitations of the study. Finally, the chapter concludes with an overview of subsequent chapters.

Statement of the Problem

Researchers (Eccles, Wigfield, & Schiefele, 1998; Elliot & Dweck, 2005; Schiefele & Csikszentmihalyi, 1995) have shown the significance of motivation in mathematics in assuring student achievement and even long-term advancement in the field. As Middleton and Spanias (1999) and Elliott, Hufton, Hildreth, and

Illushin (1999) noted, there was a decline in mathematics motivation seen most significantly during middle school and was an area of research that appeared to be lacking based on the scarcity of literature. Csikszentmihalyi (1995, p.115) stated “The chief impediments to learning are not cognitive. It is not that students cannot learn; it is that they do not wish to. If educators invested a fraction of the energy they now spend trying to transmit information in trying to stimulate the student‘s enjoyment of learning we could achieve better results.”

Providing the energy to stimulate the student’s enjoyment of learning mathematics created a challenge for educators to uncover effective ways to engage students in the learning environment. The research of Deci and Ryan (1985, 2000, and 2008) was based on ways to increase intrinsic motivation and self-determined actions. Their theory specifies three basic needs: competency, relatedness, and autonomy. Application of this research can be contributory to motivate students in learning environments that promoted academic success. Or, as Hardre and Reeve (2003) found, motivated students in positive learning environments have less chance of dropping out of school.

Motivation in mathematics is important in middle school (Ryan, 2001), because it serves as the gateway to higher level mathematics placement in high school, which is tied to college entrance criteria. This study examines both the middle school students’ and the teacher’s perspectives of how classroom practices influence mathematics performance. Classroom practices, such as questions that have students reflect on solution strategies and relationships between mathematical models, have been given attention by the National

Council of Teachers of Mathematics (NCTM 1989, 2000). Changes in teacher practices in the classroom are being viewed as one way to promote reform (Mayer, 1999). Or, as stated by Davis and Maher (1997, p.94):

> For the constructivist teacher—much like the psychoanalyst—'telling' was usually not an effective tool. In this role, the teacher was much less a lecturer, and much more of a coach (as in learning tennis, or in learning to play the piano). A recent slogan describes this by saying 'the Sage on the Stage has been replaced by the Guide on the Side.' It was the *student* who was doing the work of building or revising [his or her] personal representations. The student builds up the ideas in his or her own head, and the teacher has at best a limited role in shaping the student's personal mental representations. The experiences that the teacher provides are grist for the mill, but the student was the miller.

As more rigorous standards for students are demanded by the NCTM (NCTM, 2000, 2006) and the National Research Council (NCR; Kilpatrick, Swafford, & Findell, 2001) the pressure is on to promote these standards in the classroom. These standards include conceptual understanding, strategic competence, adaptive reasoning, productive dispositions, and procedural fluency. According to the Third International Math and Science Study (TIMSS, 2007) results, United States eighth grade students performed at or above the international average. Unfortunately, by the end of high school, United States students perform below the international average on mathematics (International Study Center at Boston

College, 1998; National Center for Educational Statistics, 2001; Office of Educational Research and Improvement, 2001).

In "*A Nation Accountable: Twenty-five Years after a Nation at Risk*," the United States Department of Education (2008) reported that proficiency levels for fourth graders in mathematics were at only 40%. The high school dropout rate was rising and less than 60% of African American and Hispanic students had graduated on time.

The U.S. Department of Education (2000, p.7) listed four critical reasons to call for an improvement in students' mathematical abilities:

1. Rapid pace of change in the global economy and workplace demands mathematics knowledge and abilities.
2. Mathematics was essential for everyday decision making.
3. Both mathematics and science are linked for national security.
4. The deeper, intrinsic value of mathematics and scientific knowledge shapes and defines our common life, history and culture.

The NCTM (2000, p.5) agreed and stated, "In this changing world, those who understand and can do mathematics will have significantly enhanced opportunities and options for changing their futures." However, Steinberg (1996, p.194) stated that "No curricular overhaul, no instructional innovation, no change in school organization, no toughening of standards, no rethinking of teacher

training or compensation will succeed if students do not come to school interested in and committed to learning."

In reference to Steinberg's statement, the present research examined an Algebra I class taught for high school mathematics credit at an urban, high-poverty middle school and the perceived impact of the teacher's classroom practices on the students' motivation and commitment to learning. This Southeastern United States school district had a membership of 138,807 students in a city of 913,639 (U.S. Census Bureau, 2009 population estimates). In 2010 the district had 178 schools with a 50.9% participation in free and reduced lunch. The site of this study was among those 178 schools. This particular middle school had been designated as a low performing school based on its failure to meet state annual yearly progress goals for the past three years. The school had 92% minority students (50.8% African American) with 86.4% of the students receiving free or reduced lunch.

Through the use of classroom observations and interviews with both the students and the teacher conducted over eighteen weeks, the study sought to identify which teacher practices influenced students to learn. Also, the perception of students on their teacher's influence in encouraging them to learn was explored as well as the teacher's perception of his contribution to his students' success.

Research Questions

The research questions were:

(1) What role do students in this Algebra I class report their teacher plays in their academic success or failure?

(2) What does the teacher report he does that leads his students to success or failure?

(3) Which teacher strategies influence students to learn Algebra I?

Significance of the Study

The study of teacher strategies in mathematics in middle school students is significant to the field of education because it could be instrumental to improving student achievement. As educators looked at the decline of motivation in middle school students (Anderman & Midgley, 1997; Urdan & Midgley, 2003), it is imperative to examine the practices that supported student achievement in the classroom setting. As greater accountability is demanded, this research can represent a contribution by better describing teacher practices that demonstrate promise in the middle school classroom.

Reys, Linquist, Lambdin, Smith and Suydam (2001) tied problem solving in middle school mathematics with connections to real life problems. The students learn by both talking and writing about those real-life problems (Reys, Lindquist, Lambdin, Smith & Suydam, 2001). In Reys et al. (2001) students learned to understand the problem presented, devised ways to solve the problem, carried out the plan devised, and then looked back at the solution. Reys et al. (2001) agreed with NCTM (2000) and promoted writing in mathematics as essential to

the organization and understanding of mathematical ideas. Pugalee (2004) included student writing as another component to student comprehension of mathematical problem solving. Reys, et al. (2001) ascertained that talking and writing about mathematics was essential to the learning process.

New standards recommended by the NCTM (2000) encouraged problem solving with connections to real life problems, teacher and student communicating using appropriate mathematical terms and providing understanding and adaptive reasoning in the classroom. Thus, this study described how one teacher encouraged problem solving connected to real life, communication using the appropriate mathematical terms, and practice of reflection while applying both understanding and adaptive reasoning to mathematics.

Assumptions

Ryan (2001) has assumed that when students do well they are motivated and that the teacher had a major role in that process. This assumption served as the basis of the present research. Further, it was assumed that all responses by the students and the teacher were given honestly and to the best of their abilities.

Limitations

This research was conducted with public school students from a high-poverty middle school in a southeastern state. These students were eighth graders from twelve to fourteen years of age. The study was limited to nineteen students, thus the group was not representative of the population of middle school mathematics students. Also, there are numerous theories that offer explanations for students'

motivation in mathematics, and this made it difficult to investigate meaningful ideas related to specific cases. No student was specifically asked about motivation nor was motivation directly measured thus making it difficult to infer motivation based on the data.

Definitions

The following terms are defined as they pertain to this research study:

*Academic Motivation: (*Pintrich and Schunk, 2002). Academic motivation is the desire to learn and the belief that school and learning are important to one's life.

Autonomy: (Deci & Ryan, 2000) Autonomy concerns a sense of volition and a willing engagement in one's behavior.

Competency: (Deci & Ryan, 2000) Competency refers to feeling effective in one's actions and capable of meeting the challenges of everyday life.

End of Course Tests: End of Course Tests given at the end of the course for credit in the subject area from 9^{th} to 12^{th} grade mandated by the state.

End of Grade Tests: End of Grade tests given at the end of the course for credit for elementary and middle school grades mandated by the state.

Learning: (Schunk, 1991). People learn by doing, they must be ready to learn, and they must be motivated to learn. Bloom (1976) defined learning as the acquisition or modification of cognitive, affective, and/or behavioral outcomes (as cited in Christophel, 1990).

Motivation: (Kleinginna and Kleinginna, 1981). Motivation is an internal state or needs, desires, and intensity of behavior.

Motivational Relationship: (Ames, 1992; Dweck, 1986). Motivational relationship is a process that leads the students to curiosity and then to investigation, with the teacher guiding the investigative travels toward persistence and completion.

Relatedness: (Deci & Ryan, 2000). Relatedness concerns feelings of connection and belongingness with others.

*Self Determination: (*Deci & Ryan, 2000) Self Determination is a theory developed by Deci and Ryan (2000) that list three basic psychological needs – autonomy, competence, and relatedness—as the central constituents for healthy psychological development.

Summary

In this chapter the problem of the decline in mathematics motivation during students' transition to middle school was explored (Anderman & Midgley, 1997; Urdan & Midgley, 2003), with more details presented in the literature review. The four critical reasons for students' improvement in mathematical ability are listed by the U.S. Department of Education (2000). These critical reasons for the improvement of students' mathematical ability were tied to the problem of the decline in mathematics motivation during that middle school transitional period. The research questions that were examined in the study have emerged from these concerns.

Further, the researcher explained the significance of the study to the field of education and the domain of mathematics. This research will contribute to an understanding of the educational practices of one teacher in a middle school classroom.

In Chapter II, the theoretical framework for the study is examined using Bruner‘s (1986) and Jonassen’s (1994) theoretical approaches of constructivism. These approaches encouraged the inquirer to seek meaning within the context of student and teacher interactions. The literature review examined recent motivational theories (self-determination theory, goals orientation theory) pertaining to student motivation in mathematics at middle school. Also, students’ motivation tied to achievement outcomes in mathematics was explored. Finally, the review examined how the effectiveness of the teacher may encourage the student learner toward achievement in mathematics.

In Chapter III, the methodology is described as a qualitative case study. The rationale for a qualitative study included the ability of the approach to conduct an investigation within a natural context using multiple sources for evidence (Yin, 2003). The participants, setting, and structured interviews are presented.

The results of the research study are presented in Chapter IV. The findings include summary tables that explicate the themes resulting from the data analysis. These data include student interviews, teacher interviews, observations of 135 classroom hours, and North Carolina End of Course test results on the students.

In Chapter V a discussion of the findings is provided. The discussion includes the researcher’s conclusions and point to some directions for future study.

CHAPTER II: LITERATURE REVIEW

This chapter begins with the theoretical framework for this research study, recent motivational theories (both goal and self-determination theory), studies on teacher effectiveness, students' motivation tied to achievement outcomes, and teacher-student relationships. The review examines how the effectiveness of the teacher may motivate the student learner toward achievement in mathematics. Beginning with the justification for the constructivism theoretical framework described by Bruner (1986) and Jonassen (1994), the chapter moves to the recent motivational theories concerning student motivation in the mathematical domain and how student achievement is affected by teacher classroom practices.

Theoretical Framework

Cognitive and social constructivism formed the theoretical framework for this study (Bruner, 1986; Jonassen, 1994). This approach encourages the inquirer to seek meaning within the context of student and teacher interactions with the understanding that human values are complex and require extraordinary efforts in uncovering those values that guide or shape behavior.

The framework for constructivism as described by Jonassen (1991, p. 29) encouraged the teacher to:

1. Create real-world environments that employ the context in which learning was relevant;
2. Focus on realistic approaches to solving real-world problems;
3. The instructor was a coach and analyzer of the strategies used to solve these problems;
4. Stress conceptual interrelatedness, providing multiple representations or perspectives on the content;
5. Instructional goals and objectives should be negotiated and not imposed;
6. Evaluation should serve as a self-analysis tool;
7. Provide tools and environments that help learners interpret the multiple perspectives of the world;
8. Learning should be internally controlled and mediated by the learner.

As noted in his first principle, Jonassen (1991) believed an appropriate constructivist environment would enable students to participate in the construction of knowledge, involving the immediate community or classroom in order to address local problems. For the constructivist, seeing a 'real world' was a reflection of one's own concepts, goals and intentions. It defined their questions and how they searched for answers. Similar to problem based learning (Savin-Baden, 2000, p. 2) which was the idea of learning by solving real world practice problems, it was "an approach to learning through which many students have been enabled to understand their own situations and frameworks so that they are able to perceive how they learn."

That first principle of Jonassen (1991) led to the second principle of the approach used by students in problem solving. It was how one functions in 'real life' to solve problems. To understand a problem one must see it as one's own problem to be solved. It allowed for multiple and viable pathways for building knowledge. Thus, it focused on what happened inside the heads of students, by assessing their interpretations and reflections within the context of solving a problem.

The third principle listed the teacher as an analyzer of problem-solving strategies taking the view (Wood et al., 1995, p. 402) that mathematics was "…both a cognitive activity constrained by social and cultural processes and a sociocultural phenomenon that was constituted by a community of actively cognizing individuals." This effectively meant that if teachers were to make appropriate choices about the strategies they used, they had to be aware of the intended outcomes as they related to their particular discipline - in this case, mathematics.

In the fourth principle the mathematical concepts provided interrelatedness with the teacher facilitating many perspectives for the student. This emphasized the importance of the teacher's role in providing multiple representations of the concepts. These representations, Becker and Varelas (1995, p. 441) "…in which a teacher's pre-existing knowledge may influence the learner's construction of new knowledge," are seen as necessary.

In the fifth principle, the negotiation united the teacher and students with a common goal. Boomer (1992, p. 14) explained that it was important, when

negotiating, for teachers to talk openly about how new information may be learned and about constraints such as the required curriculum. He commented on the meaning of negotiating the curriculum:

> Negotiating the curriculum means deliberately planning to invite students to contribute, and to modify, the educational program, so that they will have a real investment both in the learning journey and the outcomes. Negotiation also means making explicit, and then confronting, the constraints of the learning context and the non-negotiable requirements that apply.

Thus, the constructivist teacher knew (Cook, 1992, p. 16) that "out of negotiation comes a sense of ownership." This ownership motivated the student to "work harder and better" and the work will "mean more to them."

Jonassen's (1991) sixth principle involved the evaluation of the learning task. Since the students were engaged in negotiating the curriculum and became educational decision makers, the student evaluated through self-analysis his/her learning and ability to learn. Students negotiated the themes and many of their assignments, with some guidelines set up by the teacher. Thus, students have involvement in the evaluation of those assignments.

The seventh principle encouraged the provision of tools and environments for the learner by the teacher. Belenky, Clinchy, Goldberger, and Tarule (1986) explained the difference between direct instructional teacher talk and the constructivist talk where listening created the environment that provided new

understanding. The classroom environment emphasized democracy in sharing responsibility for student learning (Lester & Onore, 1990). Lester and Onore (1990) suggested that the attitudes, values, and beliefs of a teacher, specifically those related to the belief of student as constructor of knowledge, made it possible to create a democratic environment. A democratic classroom was self-regulating. Rather than overtly controlling the students, a constructivist teacher structured the classroom so that students and teacher can share in the control of their environment. Students are directly involved in all matters that occur in the classroom that affect their being there as learners and as people. However, as Lester and Onore (1990, p. 5) discovered, "changing any one aspect of a classroom, in particular how language was used, wasn't possible without simultaneously changing who has power and control over knowledge." Indeed, since student empowerment and autonomy are major goals in constructivist teaching, changing the power structure in the classroom was a desired course of action.

Finally, Jonassen's (1991) eighth principle insisted that learning was controlled and mediated by the learner. With the constructivist classroom, the instruction was student centered and the control was from students' internal focus on the task. The environment was not set up as competitive. The teacher served to guide the students toward knowledge. Thus, the relationship between the students and teacher promoted learning.

So, in the social constructivist view, as compared to the cognitive constructivist classroom, learning was defined as constructed through discourse

and social interaction (Driver, et al., 1994). Just as Vygotsky (1974) observed that students do better on task when engaged with an adult, the learner in the social constructivist theory was actively involved with the teacher in constructing new meanings.

Motivational Theories

This part of the literature review examines some of the more current theories of motivation, goal orientation and self-determination, in the academic setting. The direction for this literature review was to examine the motivational dynamics related to school achievement. Thus, these theories had strong application to academic achievement. The research that linked student achievement to motivation was clear, but the impetus that moved the student toward motivation in middle school was not as definitive. Maehr and Meyer (1997, p. 372) quoted Terrel Bell, former Secretary of Education, as saying “There are three things to remember about education. The first is motivation. The second one is motivation. The third one is motivation.”

Motivation is defined (Green, Martin, & Marsh, 2007; Wentzel, 1999) as a set of interrelated beliefs and emotions that influence and direct behavior. Also, motivation is defined (Schunk, Pintrich and Meece, 2008, p. 14) as “the process whereby goal-directed activity was instigated and sustained.” Educational researchers (Ames, 1992, 1995; Anderman, 1998; Hoy & Woolfolk, 1993; Pintrich & deGroot, 1990; Pintrich & Schunk, 2002; Ryan, Gheen, & Midgley, 1998; Ryan & Patrick, 2001; Urdan et al., 1998; Urdan, Midgley, Stipek et al., 1998; Williams & Stockdale, 2004) agree that motivation to learn is positively

correlated to academic achievement. These researchers define academic achievement as performance that demonstrates educational mastery. The two major theories, goal orientation and self-determination, were discussed because of the strong application and recent research in the field of academic achievement and motivation.

Goal Orientation

A major element in motivational theory is the role of goals. Goals are defined as the end which effort was directed. De la Fuente (2004, p. 38) defined academic goals as "…motives of an academic nature that students use for guiding their classroom behavior." Goal orientation theory (Achievement Goal Theory) stated that students have orientations toward certain goals. The dominant theoretical approach in goal orientation was one that indicated a difference between the mastery and performance orientations. Students who embraced mastery goals focused on learning and mastering academic work. Students who chose performance goals were interested in demonstrating their ability and measured their achievement by comparison to their peer's achievements. In the performance goal orientation the student avoided the task in order to avoid looking stupid or dumb in comparison to others. These different goal orientations have been researched for the past twenty-five years in Ames, (1992), Ames and Archer (1988), Harackiewicz and Elliot (1993), Nicholls (1983), and Maehr (1984).

Approach and Avoidance Goals

Mastery goals have been recently divided into approach and avoidance (Elliot & McGregor, 2001) and within this division mastery approach goals referred to an increasing level of competence by acquiring knowledge or skills, and mastery avoidance referred to the emphasis on avoiding mistakes and/or failures. Further, Pintrich (2000) illustrated mastery and performance goals with the approach and avoidance states (Table 1). Pintrich explained the table by giving examples of students who were unwilling to be wrong because of a tendency to perfectionism. He provided himself as an example of not willing to perform home repairs that he knew he may not successfully complete. This was in contrast to the work of researchers (Meece, Blumenfeld, & Hoyle, 1988; Nicholls, Cheung, Lauer, & Patashnick, 1989) who labeled the performance goal as work avoidant or academic alienation and presented a negative approach to task mastery. These students would go to elaborate means to avoid the work, this included misbehavior in the classroom, pretended illnesses, and even notes from home that excused the student from the assignments.

Pintrich (2000) illustrated both mastery and performance goal orientations with the approach and avoidance choices described in the table. The mastery goal orientation is described in the approach choice as a focus on learning and mastering the lesson. The avoidance choice in the mastery goal orientation is described as a focus on not mastering or learning the task. Pintrich also illustrated the performance goal orientation with the approach choice focused on outperforming others. The avoidance choice was focused on not looking dumb.

Table 1 lists the purpose of engaging:

Table 1

Two Goal Orientations and Approach and Avoidance

	Approach	*Avoidance*
Mastery	Focus on mastering task, learning, understanding Use of standards of self-Improvement, progress, Deep understanding of Task	Focus on avoiding, not learning or not mastering task Use of standards of not being wrong, not doing it incorrectly relative to task
Performance		
	Focus on being superior, Besting others, being the Smartest, best at task in Comparison to others	Focus on avoiding inferiority not looking stupid or dumb in comparison to others
	Use of normative standards	Use of normative standards
	Such as getting best or Highest grades, being top Or best performer in class	of not getting the worst grades, being lowest performer in class

Ames (1992) and Nicholls (1992) have supported mastery and performance goals in relation to affect, learning and cognitive strategies. The mastery and performance goals have been partitioned into approach and avoidance choices. Thus, mastery approach focused on increased competence while mastery avoidance emphasized mistake avoidance.

Elliot (1997) characterized performance goals as both approach and avoidance. Performance approach was linked to higher student aspirations,

persistence, and even (Elliot, McGregor, & Gable, 1999) higher examination performances. There has been more association with positive than negative outcomes.

The performance avoidance goals were linked strongly to negative outcomes. Researchers (Elliot, McGregor, & Gable, 1999; Midgley & Urdan, 2001) reported that students who exhibited performance avoidance choices were self-handicapping, showed little or no effort, anxiety, and reluctance to seek assistance.

New debate from researchers (Brophy, 2005; Grant & Dweck, 2003) has suggested that performance goals should be replaced by social goals. Brophy (2005) insisted that the mastery and performance goals never adequately defined the goals that students pursued in academic achievement. This led to researchers (Juvonen & Wentzel, 1996; Maehr & Midgley, 1996; Urdan & Maehr, 1995; Wentzel, 1999) agreed that social goals based on the social/interpersonal reasons students had to achieve were more appropriate in academic situations.

Social Goal Orientation

Earlier, Urdan and Maehr (1995) described four social goals that may have affected motivation in adolescents: social concern, approval, compliance, and solidarity. Within a goal orientation framework, students' social goals indicated their concern with the interpersonal reasons for achievement. Thus, this early research in the field of goal orientation indicated how those social goals had an impact on student learning and achievement as well as classroom behavior.

Another three goals-responsibility, intimacy or relationships, and status – were also explored in research (Anderman, 1999; Patrick, Anderman, & Ryan, 2002). In social responsibility the student chose to follow the classroom rules and instructions. This goal was associated to the mastery orientation with students' desire to meet formal social demands. The intimacy or relationship goal required that students maintained peer relationships and accepted support from peers. The downside happened when the need for friends dominated the academic achievement needs. Finally, the status goal involved the students who required a wider peer group with a need for social prestige that included the receipt of positive judgment from greater numbers of students.

In 2001 Dowson and McInerney inductively generated a list of goals and interviewed middle school students. These students showed the following goal orientations: (a) avoidance of work, (b) social concern, (c) social affiliation, (d) social approval, and (e) social responsibility. The students showed an avoidance of work through their reluctance to ever begin an engagement in the tasks assigned or if engaged to constantly seek assistance from others. A social concern goal was the desire to do well academically so one can assist or help others in their personal or academic development. A social affiliation goal was the desire to do well academically to enhance one's sense of belonging in the group. A social approval goal was the desire to do well academically to gain approval from others (parents, teachers, or peers). A social responsibility goal was the desire to do well academically to maintain an interpersonal commitment, fulfill one's obligation, or follow the social/moral rules.

Host, Finney, and Barron (2007) defined a social development goal as focused on social interaction with peers. The student defined success when he/she produced a greater quality of relationships with his/her peers. So, positive peer judgments were considered more important than academic success. Thus, a student may have demonstrated avoidance goal orientation to prevent an undesirable peer judgment. The student avoided negative peer judgments by not engaging in the task. These social achievement goals were described with different terms in other researchers' (Ryan, Kiefer, & Hopkins, 2004) work as mastery and performance goals.

Researchers (Dowson & McInerney, 2003, p. 100) used qualitative methods and semi-structured interviews and found that students identified the following five goals important to their school achievement: affiliation (achievement to belong to a group), approval (achievement to gain teacher, peer and/or parent approval), responsibility (achievement to meet certain rules or role expectations), status (achievement to gain or maintain position in school and in future plans), concern (achievement to assist others academically). These students were middle school aged and affiliation was strongly identified. The need for approval, responsibility, status, and concern were not as strong, but significant.

If, as proposed by Ryan, Kiefer, and Hopkins (2004, p. 311), these social goals can be viewed as mastery, performance-approach and performance-avoidance, then the mastery goal viewed in the social context would be concerned with the quality of relationships with peers. The performance-approach goal viewed in the social realm would entail gaining positive judgments

from others. The performance-avoidance would then move to avoiding negative judgments or being ridiculed by peers. These researchers argued that viewing the achievement goals from the social perspective may "…advance understanding of individual's social achievement-related processes and adjustment."

Dowson and McInerney (2001, p. 40) argued that social goals "…may actually be more salient and predictive of students' global motivation and achievement than either mastery or performance goals." These researchers' qualitative studies found that the social goals are supported by the students' reports about their engagement and achievement in the classroom. These researchers determined that work-avoidance was important to academic motivation. This orientation was tied to a number of strategies that minimized effort. The researchers hypothesized that these work-avoidant students did not value hard work. Also, the work-avoidant students did not need to display competence to their peers. The researchers classified these students as those who just wanted to complete the course with as little effort as possible.

Self-Determination Theory

Ryan and Deci (2000, p. 69) described motivation as "…energy, direction, persistence and equifinality—all aspects of activation and intention." They stated that "…although motivation was often treated as a singular construct…people are moved to act by very different types of factors." They identified three of these factors: competence, autonomy, and relatedness.

Self-determination theory was a framework for motivational studies including the cognitive and social development of the individual. This theory focused on how social and cultural factors may have encouraged or discouraged a student's initiative and the quality of their work. This Self-Determination Theory (SDT) was a formal broad theory that encompassed five mini-theories: Cognitive Evaluation Theory (CET), Organismic Integration Theory (OIT), Causality Orientations Theory (COT), Basic Psychological Needs Theory (BPNT) and Goal Contents Theory (GCT).

The Cognitive Evaluation Theory (CET) addressed the effects of social interactions on intrinsic motivation (self-initiated achievement), or how rewards, ego-involvements, or interpersonal controls affected motivation and interest. CET examined how competence and autonomy encouraged intrinsic motivation in the classroom. In 1985 Deci and Ryan proposed that CET specified factors promoted feelings of competence. However, CET would not enhance intrinsic motivation unless accompanied by the sense of autonomy. Students must not only perceive competence, but satisfy the need of autonomy.

CET focused on the needs for both competence and autonomy. The studies on the effects of rewards, feedback, and other external events on intrinsic motivation led to these results (Deci, 1971; Harackiewicz, 1979, Ryan, 1982). In several studies in classrooms (Deci, Nezlek, & Sheinman, 1981; Ryan & Grolnick, 1986) the results have shown that autonomy-supportive teachers challenged, motivated, and increased the curiosity of students. However students

who are controlled by the teacher lose initiative and learned less well (Benware & Deci, 1984; Grolnick & Ryan, 1987).

The CET mini-theory of Self-Determination Theory suggested that classroom environments either assisted or hindered intrinsic motivation by either supporting or preventing the students' need for autonomy and competence. Intrinsic motivation occurred only when the activity or task provided novelty, challenge, or value for the student. If the task did not hold this appeal, the CET did not apply.

Ryan and Deci's second mini-theory, Organismic Integration Theory (OIT) addressed extrinsic (external rewards) motivation. OIT was also concerned with social contexts that assisted or impeded internalization. This mini-theory addressed what factors enhanced the internalization of values, goals, and beliefs. OIT also examined how autonomy was affected by the internalization of extrinsic motivation. Further, the OIT identified autonomy and relatedness as critical to that internalization.

The OIT introduced the different forms of extrinsic motivation and the factors that assisted or hindered the internalization and integration of the behaviors (Deci & Ryan, 1985). Amotivation, the state of lacking an intention to act, resulted from either not valuing the task (Ryan, 1995), not perceiving competence (Deci, 1975), or not believing that the outcome was desired (Seligman, 1975). The next factor on the autonomy continuum was external regulation. This was the least autonomous motivator. The task was performed because of either an external demand or a reward. Another type of extrinsic motivation was Introjected regulation. This was when students performed under pressure either to avoid

guilt or to keep their pride (Ryan, 1982). A more self-determined form of extrinsic motivation was identification. The student has identified with the task and accepted it as his/her own. Finally, integrated regulation occurred when the student internalized the task and compared the values to his/her own. This was still extrinsic motivation because the student's behavior was based on some outcome that was separate from the task.

The intrinsic motivation did not follow a necessary sequence from extrinsic to intrinsic. A student may have begun with an interest in a task and moved back into the external regulatory mode based on the controlling teacher. Chandler and Connell (1987) indicated that students' general style tended to become internal over time, as described with the general organismic theory of autonomy and self-regulation (Ryan, 1995).

Further, Ryan and Connell (1989) investigated achievement behaviors in school classrooms and assessed external, Introjected, identified, and intrinsic motives for engagement in these tasks. They found that the four types of regulation were intercorrelated according to an ordered correlation pattern. This provided evidence for a continuum of autonomy. The more students were externally regulated the less they showed interest, value, or effort in the task and tended to blame the teacher for failure. Introjected regulation was related in a positive correlation with effort, but more anxiety and less ability to cope with failure. Identified regulation was correlated with enjoyment of school and positive coping skills. Intrinsic motivation was correlated with interest, competence, enjoyment, and positive coping skills.

The third mini-theory Causality Orientations Theory (COT), described the three types of causality orientations: autonomy, control, and amotivated. The autonomy orientation involved students recognizing value in what was occurring and projecting interest in the event. The control orientation moved toward a focus on rewards, approval or a tangible gain. Finally, the impersonal or amotivated orientation was a focus on competence and high anxiety toward achievement.

Fourth, the Basic Psychological Needs Theory (BPNT) was tied to autonomy, competence, and relatedness. Anything that supported or frustrated these needs would affect wellness. Since the theory stated that all three needs were essential, the failure to meet any of the three would result in a psychological cost.

Finally, the Goal Contents Theory (GCT) came from the differences between intrinsic and extrinsic goals and how these affect motivation. The extrinsic goals such as money, appearance, and fame were compared to intrinsic goals such as relationships, personal growth, and community with extrinsic goals leading to less satisfaction and lower wellness.

Since teachers are the adults within the school setting that influence both relatedness and autonomy, researchers (Goodenow, 1993; Grolnick & Ryan, 1987; Midgley et al, 1989; Ryan & Grolnick, 1986; Wentzel, 1997) have demonstrated significant associations between students' achievement and autonomy support from their teachers. The study of Ryan and Grolnick (1986) found that students who viewed their teachers as supportive felt a sense of competence and were more intrinsically motivated. This study also found that conceptual learning was improved when teachers encourage autonomy. Midgley

et al. (1989) reported that students did go backwards when they were moved from a classroom with high teacher support to classrooms with a more controlling teacher. These students showed decreases in interest and negativity toward learning. Goodenow (1993) found a positive correlation between academic effort and achievement to teacher autonomy support. Finally, Wentzel (1997) found that students in middle school were more interested in classroom tasks if they perceived teacher support. Taken together, these findings showed that perceived support from teachers was a significant predictor of students' perceived competence, motivation, and academic achievement. This finding led to an exploration of teacher effectiveness. Teacher effectiveness was defined as "…teaching practices that have a positive impact on student achievement" (Vandervoort, Amrein-Beardsly, & Berliner, 2004).

Teacher Effectiveness

Effective teachers are those who achieve the goals which they set for themselves or which are set for them by others (N.C. State Curriculum Standards, 2009). Medley (1982) stated that effective teachers must possess both knowledge and skills. The way teachers use their knowledge and skills in the classroom are referred to as teacher performance. Finally, the accomplishment of the goals set for the teacher or by the teacher tied to their knowledge and skills and classroom performance equals teacher effectiveness.

There are assumptions to the idea of teacher effectiveness: (a) teachers actively pursue goals that guide their planning, behavior and interactions with students; (b) teachers teach for a purpose (Anderson et al., 2001, p. 3); (c)

teachers' goals are concerned with students' learning; (d) teachers may not be effective in every aspect of their profession (Porter & Brophy, 1988). Teachers who were consistently effective were those teachers who were able to adapt their knowledge and skills to the demands inherent in various situations so as to best achieve their goals. Doing what was best to achieve these goals, rather than doing certain things in certain ways or using certain methods or techniques, was the hallmark of an effective teacher. An effective teacher was one who consistently achieved goals that were related directly or indirectly to student learning (Anderson, 2004, p. 25).

In the past fifteen years research data have provided answers to which variables influence student achievement. Additional evidence from researchers (Brophy, 2001; Creemers, 1999; Hay McBer, 2000; Scheerens, 2003) supported the teacher influence on student achievement. These teacher effects outweighed differences in both class heterogeneity and class size (Darling-Hammond, 2000). Students assigned to ineffective teachers had significantly lower achievement than those assigned to highly effective teachers (Sanders & Rivers, 1996). Thus, teacher effectiveness was both cumulative and additive.

Creemers (1999, p. 12) stated that intellectually challenging teaching in classrooms where teachers "were stimulating and enthusiastic" and provided "higher order questions and statements" where students "use powers of problem solving" exemplified effective teaching. The researcher stated further that students performed better with teachers who "devoted most of their time" in communicating with the whole class.

Scheerens (2003, p. 10) stated teachers would be seen as “the prime managers of teaching and learning in classrooms.” Further, the teacher could “influence student learning “in indirect ways, such as teacher competencies, influence in establishing the learning environment, choices of text, assessments, and his/her direct teaching strategies. Specifically in the mathematics classroom, the teacher should have provided multiple representations, fast recognition of mistakes, and maintain the level of cognitive complexity, while keeping students responsible for their own learning.

Research consistently showed that teachers have the greatest potential to influence students’ education. “The major research finding was that student achievement was related to teacher competence in teaching,” noted Kemp and Hall (1992, p .4). Evidence from teacher-effectiveness studies indicated that student engagement in learning was to be valued above curriculum plans and materials. Research on teacher effectiveness had yielded a wealth of understanding about the impact that teachers had on student achievement.

In recent literature (Kukla-Acevedo, 2009, p. 49) the research “illustrates that individual teachers generate differential effects on students’ test scores and other outcomes.” The challenge faced by researchers was how to identify those specific teacher characteristics significant to student achievement. This led to the review of student motivation tied to achievement outcomes.

Teacher effectiveness factors have been defined as teacher characteristics. These characteristics are traits that are indicative of how the teacher practices. Table 2 identifies 12 teacher characteristics (Hay McBer, 2000) from a study

conducted in Great Britain. The characteristics are divided into four headings: professionalism, thinking/reasoning, expectations and leadership. Table 2 is the summary of Hay McBer's (2000) study. The study is dividing the characteristics into clusters. The clusters include professionalism, thinking or reasoning, expectations, and leadership.

Table 2

Summary of characteristics associated with more effective teachers

CLUSTER	CHARACTERISTIC	DESCRIPTION
Professionalism	Commitment	Commitment to doing everything for each student and enabling all students to be successful.
	Confidence	Belief in one's ability to be effective and take on challenges.
	Trustworthiness	Being consistent and fair, keeping one's Word.
	Respect	Belief that all individuals matter and Deserve respect.
Thinking /Reasoning	Analytical	Ability to think logically, break things down, recognize cause and effect.
	Conceptual Thinking	Ability to identify patterns and connections, when a great deal of detail was present
Expectations	Drive for Improvement	Relentless energy for setting and meeting challenging targets, for students and the school.
	Information Seeking	Drive to find out more and get to the heart of things, intellectual curiosity.

	Initiative	Drive to act now to anticipate and pre-empt Events.
Leadership	Flexibility	Ability and willingness to adapt to the needs of a situation and change tactics.
	Accountability	Drive and ability to set clear expectations and parameters and hold others accountable for performance.
	Passion for Learning	Drive and ability to support students in their learning, and to help become confident, independent learners.

Source: Hay McBer, 2000

The characteristics of commitment and drive for improvement have been identified by Slavin et al. (1995) as ‘relentlessness’ and by Anderson and Pellicer (1998) as ‘zero tolerance for failure’.

Student Motivation: Tied to Achievement Outcomes

Developmental research has shown that student motivation was tied to achievement outcomes because as students age into middle school they became more sensitive to their competence (Eccles, Wigfield, & Schiefele, 1998; Pintrich & Schunk, 1996). The low achieving students became vulnerable to teacher feedback and students began to assign reasons for their success or failure. When he/she had success, he/she may have perceived this as effort and innate ability. However, when the student was unsuccessful, he/she would assign the failure as incompetence. The more failures he/she experienced, the less likely to continue on the task. Once that student doubted his/her competence, the more

likely the failure was blamed on lack of ability and any success was assigned to luck or an easy test.

Thus, student motivation was linked to student achievement outcomes (Dweck, 2000). Dweck (2000) described how students experiencing repeated failures would embrace a feeling of learned helplessness in the classroom. These students would then become disengaged from the task, the classroom, and eventually the school.

So, students who perceived control or autonomy over their own learning have shown increased motivation for learning. They exhibited drive to success and this was especially true when teachers offered autonomous support. In a questionnaire on the problems in school (Deci, Ryan, & Schwartz, 1981) taken by middle school students to examine their regulatory style over five months, the students who rated their teachers as control-oriented did less well than those in autonomy-supported classes. In fact, those students who rated teachers as autonomy-oriented reported internalizing work habits with greater internal control over their achievement outcomes. This would then lead to the examination of teacher and student relationships in the classroom.

Teacher and Student Relationships

Noddings (1992) stated the first job of teachers was to care for students. The researcher asserted that all students wanted to learn, though not necessarily what they are asked to learn, but students cannot learn if not cared for. Since caring would prepare the student to be receptive to learning, then teachers

should learn to care. In the middle school it was more difficult to develop good student and teacher relationships because of the time spent in the classroom with a single teacher was limited. Yet a teacher may have had a profound effect on a student (Pajares & Urdan, 2008).

Research confirmed the stories that teacher-student relationships contributed to students' academic motivation. Learner and Kruger (1997) confirmed that though attachment to both parent and teacher contributed to academic motivation and achievement, the teacher-student relationship more strongly predicted achievement. They suggested that research reflecting a decline in perceived quality of student-teacher relationships in secondary school may be the result of changes in the way classes are scheduled or taught. The authors suggested that secondary school teachers have spent more time maintaining discipline in the classroom than ensuring that students' needs are being met. Secondary school tended to emphasize course content over nurturing students. These researchers believed this was a mistake.

Wentzel (1997) showed that middle school students who believed their teacher cared about them were more motivated to try harder and pay closer attention in class. These students also earned higher grades. While Eccles et al. (1993) showed that middle school students who had poor teacher-student relationships in mathematics classes were prone to not value mathematics.

Research predicted that greater academic motivation and greater student knowledge was likely from secure teacher-student relationships (Howes & Hamilton, 1992; Howes & Jones, 1995; Kontos et al, 1995; Whitebook et al.,

1989). When teachers were involved with students, sensitive toward students, and had frequent positive interactions with students, the results showed both motivation and achievement. In secondary schools, (Osteman, 2000, p. 344) how "students feel about school and their coursework was in large measure determined by the quality of the relationship they have with their teachers in specific classes." When students perceived their teachers were supportive, they had greater engagement and interest in their studies. Those studies that showed the effects of teacher-student relationships (Good & Brophy, 1997; Ryan & Grolnick, 1986) predicted that students who perceived their teachers as cold and uncaring would have lower intrinsic motivation. Good and Brophy (1997, p. 23) said, "Studies conducted in quite different settings have shown that student achievement can be affected by expectations induced in instructors." These studies suggested that teachers should have provided a warm relationship with all their students. To be motivated to learn, students needed both ample opportunities to learn and a teacher's encouragement.

A key element (Alison, 1993) was to establish a relationship of mutual trust and respect with the learners, by means of talking with them on a personal level. This mutual trust could have led to enthusiasm from the student. Enthusiastic teachers imparted a sense of commitment to, and interest in, the subject, not only verbally but through body language and cues that modeled acceptable behavior. Teacher encouragement and support of their students' learning efforts provided a perception of autonomy in the students. Since such motivation was unlikely to develop in a chaotic classroom, it was essential that the teacher

organize and manage the classroom as an effective learning environment. Further, because anxious or alienated students were unlikely to develop motivation to learn, it was important that learning occur within a relaxed and supportive atmosphere (Good & Brophy, 1994, p. 215). Good and Brophy (1994, p. 228) noted that "the simplest way to ensure that people value what they are doing was to maximize their free choice and autonomy." How teachers maximized students' free choice and autonomy to motivate them was a foundation of this research. More specifically, this study investigated:

(1) What role do students in this Algebra I class report their teacher plays in their academic success or failure?

(2) What does the teacher in this mathematics class report he does that leads his students to success or failure?

(3) Which teacher strategies influence students to learn Algebra I?

Summary

This literature review began with the theoretical framework for this study, recent motivational theories (goal theory, social orientation, and self-determination theory), studies on teacher effectiveness, student motivation tied to achievement outcomes, and teacher-student relationships. Throughout the motivational research (Good & Brophy, 1997, p. 23) "conducted in quite different settings…student achievement can be affected by expectations induced in instructors." Alison (1993) insisted that teachers show enthusiasm, interest, and portray that encouragement to the student through body language, verbal cues,

and modeling. This research was informed by the theories presented in this chapter.

The following chapter presented the methodology for the qualitative case study with detailed description of the setting, students and teacher participants, and a description of the curriculum for Algebra I for high school credit. Data collection methods included classroom observations, student interviews, teacher interviews, field notes and defined the role of the researcher.

CHAPTER III: METHODOLOGY

This chapter begins with an introduction and definitions of the terms followed by a detailed description of the setting. The setting included the overview of the district, the middle school, and the particular classroom. The description of the students' coursework in the classroom was also examined. Further, the actual layout of the classroom was illustrated. The student participants were described as well as the teacher participant and the role of the researcher in this setting. The data collection included observational data, student interviews, teacher interviews, field notes, and some explanation for the data coding process.

This investigation was a qualitative case study designed to provide detailed information of a mathematics classroom in a low performing middle school. The purpose of a case study was Gall et al. (2003, p. 438) "to develop an understanding of a complex phenomenon as experienced by its participants." This study was viewed from the lens of social and cognitive constructivism, self-determination motivational theory, and cognitive learning theory. These views stressed the role of social interaction, retention of learning through sustained practice, and students' perception of relatedness, competency, and autonomy. These theories (Gall et al., 2003) operated under the same premise that meaningful learning occurred when learners were engaged in meaningful activities in a climate that both supported and challenged their thinking.

The rationale for a qualitative study was the ability to conduct an investigation within a natural context using multiple sources of evidence (Yin, 2003). For this study (Patton, 2002) there were three types of data collection methodologies: direct observations, in-depth and open-ended interviews and examination of documents. Using the qualitative descriptive case study design, the researcher was able to deduce the answers from “inductive” analysis (Patton, 2002). The patterns, themes, and categories came from the collected data rather than being imposed upon the data (Patton, 2002).

Yin (2003) presented three types of case studies: explanatory, exploratory, and descriptive. Since the exploratory case study was used more as a pilot to create other studies, this type of case study did not answer for this research. The explanatory case study was described as a study to test research theories and an explanatory test of research theory was not the intent of this study. The descriptive case study was used to present answers based on theory. The descriptive case study was chosen for this study because the researcher wished to develop an understanding of students’ perceptions of how their teacher motivated them toward achievement and how the teacher perceived his own role in the achievement process. The research was based on social and cognitive constructivism, self-determination, and cognitive learning theory.

This descriptive case study was designed to observe a “real life” (Miles & Huberman, 1994) situation. With a descriptive case study the ability to observe and interview the students and teacher to gain an in-depth understanding of the classroom experience was possible. Studies that investigate the quality of

activities, relationships, and situations are referred to as qualitative research designs (Fraenkel & Wallen, 2000). Since the research questions for this study indicated an investigation of the activities and relationships in the classroom; the qualitative research design was selected.

The nature of the research questions determined the use of the case study with the qualitative inquiry approach (Glesne & Peshkin, 1992; Merriam, 1988; Wang, 2002). The research questions are:

(1) What role do students in this Algebra I class report their teacher plays in their academic success or failure?

(2) What does the teacher report he does that leads his students to success or failure?

(3) Which teacher strategies influence students to learn Algebra I?

The decision to use the descriptive case study approach was based on the in-depth description that I wanted. Fraenkel and Wallen (2000, p. 12) described a case study as “an in-depth description written by an independent author(s); a detailed accounting of an educational interaction and its effects, and intended to help understand both the dynamic relationships and views of stakeholders (rather than evidence of cause and effect).”

The chosen classroom and teacher were then determined by the anomaly of the achievement results from that particular school. The school was defined as a “focus” school, meaning that for three consecutive years this school had not met district requirements of achievement. This particular mathematics teacher had consistently shown high student achievement scores each year in his

classrooms. Yin (1994, p. 7) explained, “The case study’s unique strength was its ability to deal with a full variety of evidence.” The anomaly of the classroom that had high gains on Algebra I for high school credit in a low-performing middle school did call for a “detailed accounting of an educational interaction and its effects” as noted by Fraenkel and Wallen (2000, p. 12). Therefore, the design of this study was a qualitative case study because the research questions were best explored by this type of research (Glaser & Strauss, 1967; Strauss & Corbin, 1994; Yin, 2003).

Definitions

Middle School is defined as a school limited to grades sixth through eighth.

*Lateral Entry Teacher i*s defined as a teacher who has not completed the typical teacher education program, but has at least a four year degree in the course or courses that he/she teaches while gaining additional credits in education.

Algebra I for high school credit is defined by the North Carolina Standard Course of study. (See Table 3, NCDPI, 2009).

High Growth is defined by a change ratio of 1.50 or better in student achievement. (The ABCs of Public Education: August 4, 2009)

Adequate Yearly Progress is defined as a measure yearly of progress of different groups of students at the school, district, and state levels against a yearly target in reading and mathematics. These targets are both proficiency and participatory. There is a minimum level of progress in both reading and mathematics proficiency made by students each year.

Setting

This middle school was one of thirty-two middle schools located in a large urban school district in the Southeastern United States. The district enrolled more than 133,600 students in kindergarten through the 12th grade in 176 schools in the county. This diverse mix of students in the district represented 160 countries with their cultural and ethnic backgrounds. Forty-eight (48%) percent of the students in the district received free and reduced lunch. This middle school had 85.6% free and reduced lunch and was considered a high poverty school. The school had 56.3% Black, 6.8% White, 1.2% Asian, 34.5% Hispanic, and 1.2% Multi-Racial. The adequate yearly progress for this school was 64% in 2006, 68% in both 2007 and 2008. Some data on Algebra I (for high school credit) showed High Growth (a change ratio of 1.50 or better) was met in 2008. This data were puzzling in that the school did not show High Growth on the previous two years in Algebra I for high school credit.

The students in this study were students taking Algebra I for high school credit in the first period class taught by a lateral entry teacher. There were nineteen (19) students who agreed to participate in the study. North Carolina established a Standard Course of Study in 1898 to determine competencies for each grade level and each high school course uniform across the state. The Standard Course of Study was based on the competencies for each grade level and the high school courses. The Standard Course of Study has been revised since 1898 to update the competencies required for successful completion of study for each of the courses in the core curriculum. Additional courses have been added to the

North Carolina Standard Course of Study over the years to include courses in technology and the mathematical requirements to master these courses.

The Standard Course of Study for Algebra I in middle school for high school credit was presented in Table 3:

Table 3

North Carolina Standard Course of Study for Algebra I

(North Carolina Department of Public Instruction, 2009)

<table>
<tr><td colspan="2">Algebra 1 continues the study of algebraic concepts. It includes operations with polynomials and matrices, creation and application of linear functions and relations, algebraic representations of geometric relationships, and an introduction to nonlinear functions. Students will be expected to describe and translate among graphic, algebraic, numeric, tabular, and verbal representations of relations and use those representations to solve problems. Appropriate technology, from manipulatives to calculators and application software, should be used regularly for instruction and assessment.
Prerequisites:
a. Operate with the real numbers to solve problems.
b. Find, identify, and interpret the slope and intercepts of a linear relation.
c. Visually determine a line of best fit for a given scatter plot; explain the meaning of the line; and make predictions using the line.
d. Collect, organize, analyze, and display data to solve problems.
e. Apply the Pythagorean Theorem to solve problems.</td></tr>
<tr><td colspan="2">Number and Operations</td></tr>
<tr><td>Competency Goal 1</td><td>The learner will perform operations with numbers and expressions to solve problems.</td></tr>
<tr><td></td><td>Objectives
1.01 Write equivalent forms of algebraic expressions to solve problems.
a. Apply the law of exponents
b. Operate with polynomials.
c. Factor polynomials.

1.02 Use formulas and algebraic expressions, including iterative and recursive forms, to model and solve problems.

1.03 Model and solve problems using direct variation.</td></tr>
<tr><td colspan="2">Geometry and Measurement</td></tr>
<tr><td>Competency Goal 2</td><td>The learner will describe geometric figures in the coordinate plane algebraically.</td></tr>
</table>

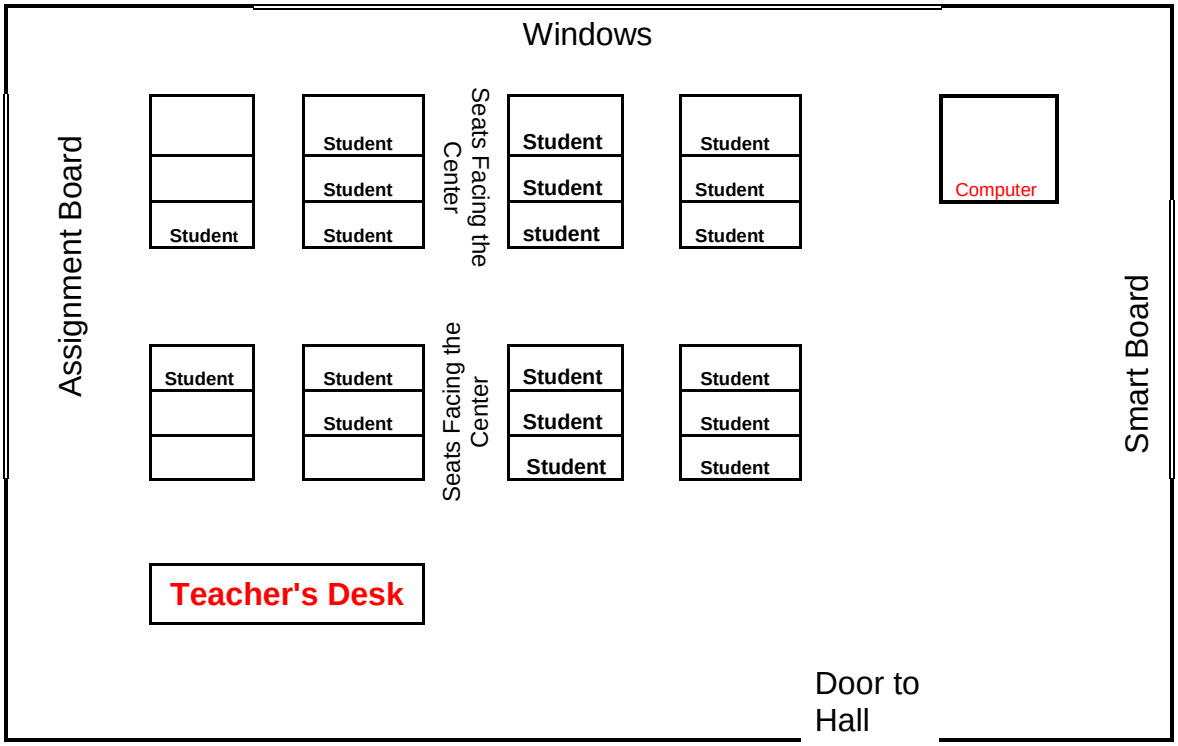
	Objectives 2.01 Find the lengths and midpoints of segments to solve problems. 2.02 Use the parallelism or perpendicularity of lines and segments to solve problems.
Data Analysis and Probability	
Competency Goal 3	The learner will collect, organize, and interpret data with matrices and linear models to solve problems.
	Objectives 3.01 Use matrices to display and interpret data. 3.02 Operate (addition, subtraction, scalar multiplication) with matrices to solve problems. 3.03 Create linear models for sets of data to solve problems. Interpret constants and coefficients in the context of the data. Check the model for goodness-of-fit and use the model, where appropriate, to draw conclusions or make predictions.
Competency Goal 4	The learner will use relations and functions to solve problems.
	Objectives 4.01 Use linear functions or inequalities to model and solve problems; justify results. a. Solve using tables, graphs, and algebraic properties. b. Interpret constants and coefficients in the context of the problem. 4.02 Graph, factor, and evaluate quadratic functions to solve problems. 4.03 Use systems of linear equations or inequalities in two variables to model and solve problems. Solve using tables, graphs, and algebraic properties; justify results. 4.04 Graph and evaluate exponential functions to solve problems.

The table sets out the four main competency goals for the successful completion of Algebra I for high school credit. The students were required to not only pass the course, but an end-of-course test in order to receive the high school credit. All of the school system mathematics teachers were given course curriculum guides for the Algebra I for high school credit and the textbooks for the course. The district provided mathematics coordinators to meet with the mathematics teachers both formally in scheduled meetings and informally in their classrooms.

This middle school had major construction during the observation period. This construction required that the particular observed classroom was located in a mobile unit that held five classrooms, two bathrooms, and a counselor's and assistant principal's office. The classroom was set up with a Smart Board, computer access, inter-communications, and telephones. This classroom had the chairs set up with four rows facing the center of the room with three student desks in each row. The other side of the room also had the chairs set up with four rows and three student desks in each row facing the center of the room. This enabled the teacher to move around in the center of the room with the Smart Board positioned on the right-hand wall as the students entered the room.

Mr. Jones spent the entire 90 minute block of time on his feet working at the Smart Board, observing the students work at the Smart Board or walking between the columns of desks communicating individually with each of the students in the classroom. He noted what each of the students were doing for problem solving at the Smart Board and from the student seated during the

Smart Board demonstrations. The layout of the room was diagrammed in Appendix G.



Appendix G: The classroom of Mr. Jones

This drawing indicated the layout of the classroom. The student desks were in four columns with three student desks deep. The rows of student desks closest to the door had students facing the center of the classroom. The student rows closest to the windows had the students facing the center of the classroom. Mr. Jones moved between the Smart Board on the far right wall, down the center aisle and up and down the rows of student desks. As the class ended, Mr. Jones moved briskly to the door to the hall and thanked the students as they left his classroom. As the students entered his classroom, he muttered phrases of encouragement, “Let’s work today!” or “Just do it!” and each phrase was unique to the individual student as they entered the room.

Student Participants

The students who had agreed to participate in the study had all scored “on-grade-level” in seventh grade mathematics for the End-of-Grade tests the prior year. These mathematics test scores indicated that the student had sufficient knowledge to cover the competency goals in the middle school seventh grade mathematics standard course of study as described previously. There were twelve (12) females and seven (7) male students in the study. There were 5 Caucasian females and 7 African-American females. There were 5 African-American males and 2 Caucasian males. The students were all native English speakers and were not identified as special education or remedial education services. The students were ages 12-14 years.

Teacher Participant

The teacher was a lateral-entry teacher, meaning that he had not attended college to become a teacher, but was hired with the understanding that he would obtain the necessary education courses within five years of the date of his employment with the school system. He had been a teacher for two years under this contract during the study period. Three years prior to obtaining the teaching position, he was employed as a mechanical engineer with a company that went out of business. He graduated from Tuskegee University with the engineering degree. He had married after college and had one middle school aged daughter. He worked one year at this middle school while taking one education course. During the summer between his first and second school year he took a course at a local college in how middle school students’ brains developed. He offered paid

tutoring services upon request from adults or high school students' parents during his second summer, but did not accept money for tutoring his middle school students.

Another interesting fact about the teacher involved some tutoring he did for the researcher's son, Tom. Tom was a student accepted to the university, but turned away in the summer when he had neglected to complete his last semester of trigonometry. The university admissions agreed to accept him if he completed the course during the summer term. A frantic researcher/mother sought the services of one tutor. That hour was completed with the son still depressed and positive that he would not be able to attend the university. Mr. Jones was recommended by a colleague. After 30 minutes of interaction with this student, there was a complete physical change. The student was walking with upright posture and a smile on his face. He commented that with the help of Mr. Jones he would be attending the university. He was right! What did Mr. Jones do to accomplish this change? The researcher's son was not sure. He stated that Mr. Jones believed he could do it. He said that Mr. Jones made it easy.

This teacher was well respected by his colleagues. He was voted by his colleagues as "2009 teacher of the year" for the middle school in which he worked. He was noted by the principal as being well above standard on his evaluations.

Role of the Researcher

The role of the researcher in this qualitative case study was one of interviewer, observer, and collector of documents (Bogdan and Biklen, 1998).

Since it was not possible to be free of biases, there were attempts to identify personal beliefs that could influence any lack of objectivity. As a teacher since 1983 in the same district as the research study, there was strong familiarity with the district's policies and expectations for the schools and teachers in the classroom. It was a personal belief that students constructed knowledge while drawing from their own world and prior knowledge. Having been trained in the state's instrument for teacher evaluation known as the North Carolina Teacher Performance Appraisal Instrument Revised (NC TPAI-R), this training could have impacted the observational data. This instrument tended to ignore the creativity of the teacher and rewarded the teacher directed model. Further, past experiences in the classroom had shown that the preferred teaching model for this researcher was one that was teacher directed and structured. The researcher's personal view of teachers as powerful and effective agents for student change was also identified as a bias.

Data Collection

The data included (a) observational data (b) taped interactions within the classroom (c) student interviews (d) teacher interviews (e) past achievement data on each student participant and (f) achievement data showing the end of course Algebra 1 for high school credit students' test results at the end of the study. The observational data included the taped interactions in the classroom, notes during the observations, and follow-up notes written soon after the classroom observations. The student interviews were also taped with a small digital recorder. The interviews with the students were open-ended. The researcher

interviewed all nineteen (19) of the students with the same series of questions (Patton, 2002) because of a desire to minimize interviewer effects. The purpose (Patton, 2002) of the open-ended standardized interview was to minimize any interviewer effects by asking the same question of each respondent. The questions were selected in advance which may leave little flexibility in tailoring a question to a particular individual or circumstance observed. However, the comparability of responses when time was limited was the strength of the open-ended standardized interview along with the minimization of the interviewer bias. Patton (2002) developed this summary of the open-ended interview:

The specific wording and sequence of questions are pre-determined, all participants are asked basic questions in the same order, and all questions required open-ended responses. The strengths of the open-ended interview (Patton, 2002, p. 39) are “The comparability of responses may be strengthened. The completeness of data for each person is enhanced. The effects of interviewer biases are minimized. The analysis and organization of data are facilitated.” Though there were weaknesses in the standardization of the questions for each individual, the ability to ask the same open-ended questions and eliminate the interviewer biases and ease of analysis far outweighed the weaknesses.

Since the goal of this study was to go into the classroom and discover what was going on there, the observations were used to “flesh out” the study. What did Mr. Jones do that was different from the student’s other classroom teachers in their opinions? When did he begin class? How did he relate to his students in

their opinions? How did the students relate to him? How did he manage the class? What teaching strategies did he use? Since there were no preconceived notions (except researcher biases) of what did happen in the classroom the researcher went into the field to discover the dynamics of this classroom. The observational data should assist in these findings.

Thus, observation was to be the most common (Trochim, 2006) method for collecting data and the most demanding. Patton (2002) noted that the validation of observational data were critical as well as being aware of the strengths and/or limitations of the observer. Because the students and teacher (the observed) may behave differently when they know they are being observed, it was difficult to observe natural occurrences under true and unbiased (Patton, 2002) conditions. Thus, it was decided that this researcher should always enter the classroom and be settled before the arrival of the first student. This researcher would always sit quietly in the room with the digital recorder out of sight. The notes would be written unobtrusively. The students would all exit the classroom and would not see the researcher communicate with Mr. Jones, the teacher. The rationale was that to be present, but not a part of the proceedings. These deliberate actions were intended to help become invisible as the students became accustomed to an extra adult in the classroom. A seat was chosen to view the entire classroom without being viewed by the students. This position allowed unobstructed views of each of the students, Mr. Jones and the Smart Board. This choice was ideal because Mr. Jones did not sit down in any of the

135 hours of observations. He had his room arranged so that there were four columns of desk on each side of the center of the classroom. There were only three student desks in each column facing the center (see Appendix F). Though the room accommodated twenty-four (24) students, there were only nineteen in this study.

Since multiple data strengthens research findings, the use of observations, notes, interviews of teacher and students, and finally records of achievement (past and present). Thus, it was possible to triangulate or “give a more detailed and balanced picture of the situation” (Altrichter, et al. 2008) with findings from various sources. A complex, holistic picture of this classroom and the participants was built. Cresswell (1994) charged the researcher with collecting and analyzing a variety of materials, both observational and historical. So this researcher used interviews, observations, and achievement data to construct an answer to the research questions.

The achievement data for each of the student participants for the prior year’s mathematical end-of-grade test were collected and noted. These data were collected to enable the researcher to determine the prior knowledge of the student participants. Each of the student participants was on grade level for mathematical ability. The end-of-course Algebra I for high school credit scores were collected at the end of the school year. This end-of-course Algebra I state test data collected from Mr. Jones’s classroom were compared to data collected from a similar middle school in the district. The students in the similar classroom were not identified as special education or English as Second language students.

There were nineteen students in this middle school Algebra I for high school credit class. The students were ten females and nine male students. Seven of the females were African-American and three were Caucasian. There were four Caucasian males and five African-American males in the class. This similar school was chosen because it was also considered a focus school with all the same additional resources as the study school. These additional resources included:

Reduced student-teacher ratios (based on grade levels)

Additional instructional supplies and materials

Added incentives for teachers, which include:

A signing bonus for newly hired, permanent teachers

meeting the eligibility requirements.

Financial assistance for teachers enrolled in master's degree programs

(Certain restrictions apply.)

A $2,500 stipend for teachers who hold a master's degree

And a $1,500 stipend for teachers enrolled in a graduate

level program. To receive the stipends, teachers must

annually meet these and other requirements outlined

in the annual retention incentive for master-teachers

criteria on the district's web site

Observations

In order to set up a schedule for observations, the researcher met with the teacher to work out a plan for observation. It was determined that observations

should occur all five days of the week for his first period Algebra I class for eighteen (18) weeks. These observations would begin when the students started third quarter and end before the final examination week. This would allow approximately ninety periods of observations with each period of ninety minutes or one hundred and thirty five (135) hours of observations. Permission was given to record any conversations in the classroom. The teacher believed that a video camera might be too much distraction for these middle school students and he did not want to compete with any distractions. A choice of seats in the classroom and access to the teacher during his planning periods was granted. Further, when the teacher knew in advance of some glitch (such as student picture day, pep rallies, or field trips) in the scheduling, he notified the researcher by email or telephone call.

The classroom was in a multiple classroom mobile unit that had been placed on the school's track field. The room was equipped with a SmartBoard, but was not spacious. The observations were all recorded with a digital recorder. The digital recorder was tucked into the side of a purse and was not visible to either the students or the teacher. There were written observation notes that reflected things that would not be picked up by the recorder, for example, the expressions on the participant's face, the hand gestures, shrugs, and reminders of student or teacher behaviors not recorded.

After each observation and after all the students had exited the classroom, the researcher thanked the teacher and went to the counselor's office. As a program counselor for the district, there was permission granted by the district to work in

this confidential environment during the research. There was transcription of the recordings and observations. These data gave the opportunity to revisit the teacher during his planning period to check with him on what had been observed if necessary. These informal interviews with the teacher occurred eighteen (18) times during the five months and generally lasted from five to ten minutes.

The observations were conducted between January 2009 and May 2009. The observations each lasted ninety (90) minutes. The data were collected over two quarters beginning after the winter break and ending the last two weeks of the school year. Data collection from classroom observations took place daily at 9:35 AM until 11:00 AM. On several occasions, the teacher was told that his class would switch schedules and meet at 2:30 PM until 3:45 PM. This scheduling change allowed an opportunity to observe the same class of students at different times in the school day. The observations totaled 90 classroom days over five months with 135 total hours in the classroom.

By transcribing the data immediately after each class, the researcher was able to categorize data into (a) teacher/student interactions in the learning environment; (b) teacher strategies; (c) students' engagement within the classroom; (d) teacher's non-verbal cues, and finally (e) some unknown factors inherent in the teacher's practice. Also, field notes were always included with what was observed in the classroom. These notes prompted a look for similar findings in the future. Using digital recording transcriptions, classroom notes on body language, gestures, and facial expressions, it was possible to identify some categories or themes each day. There was categorization of similar gestures and

body language: positive, enthusiastic, disappointed, and patient. It was noted that there were similar facial expressions for disappointment after several weeks. There was also the use of patient body language and gestures when he motioned for others to wait for a student to answer.

Student Interviews

The students were interviewed individually before the school day began. An arranged interview time for each student was established with the students on an individual basis through the counseling office. Both the student and the parents had agreed to the student interviews. All nineteen students were interviewed once.

Each student was asked the same six questions (Patton, 2002) in the same order. The first question asked, “How was Mr. Jones different from other classroom teachers you have had in the past?” This open-ended question was intended to get a feeling for how the student viewed Mr. Jones as both a teacher and a person. The students’ comments resulted in scheduling some follow-up sessions to clarify answers for fourteen of the students.

The second interview question was “What did you learn in Mr. Jones’s class?” The intent of this question was to capture how the student viewed Mr. Jones as a teacher communicator. Also, there was the expectation that the student would convey some sense of not only what he/she learned in the class but some of the experience behind that learning. The students’ answers were coded to place into themes or categories.

The third open-ended interview question asked “What did Mr. Jones do today?” The question was posed to tap into some of the teacher’s strategies or actions in the classroom experienced by the student. This question was followed by “What would you say about Mr. Jones’s class?” Again, the question was open-ended to allow the students to report feelings, facts, and even some discussion regarding the classroom. As the students answered the questions, they were digitally recorded and notes were taken on facial expression and body language.

The fifth question was “Do you believe that you are learning in the class? How? Why?” This question was intended to draw out the student’s response to a question that may be answered with a simple yes or no. This question would allow the student to think through the classroom dynamic and determine how the learning occurred. Another question along those lines was question six, “Do you do your homework for the class? How often? Why?” The homework issue was asked to determine motivation toward doing work outside the classroom. This question would also elicit more from the student than a simple yes or no. The question of “Why?” would elicit more commentary from the students.

Once all nineteen students were interviewed, fourteen (14) of the students were asked for a follow-up interview. The fourteen (14) students were chosen based on their previous answers on the open-ended interview questions. Either there was not enough detail to the responses, or additional follow up on the considerable detail offered was needed. Also, the research demanded a clarification of some answers or some member checks on their responses. In

categorizing data, it was necessary to have some short, focused re-interviews to gather data to verify some key observations.

Teacher Interview

The teacher was interviewed formally four times and informally eighteen times. The formal interviews took place in his classroom during his planning period. These formal interviews were set up with Mr. Jones in advance and he was given the questions in advance. The four formal interviews lasted from forty to sixty minutes of his ninety minute planning period. The eighteen informal interviews were brief (five to ten minutes) to clarify observational details or member checking. The questions asked for the first formal interview were:

(1) What do you believe generates the most interest in your lesson? This question was posed to note what the teacher believed he saw in the students' reactions to his lessons.

(2) How do you reward or punish students? This question was intended to determine if Mr. Jones used intrinsic or extrinsic motivators.

(3) How do you convey displeasure with the students? Let's say they won't try? This question was asked to determine relationships with those students who offered resistance in the classroom.

(4) Discuss your strategies in the classroom. This was a discussion question that left open the opportunity for Mr. Jones to clarify his teaching strategies.

(5) Do you give and grade homework? This was an exploratory question asked to determine his beliefs in reinforcement of classroom instruction.

(6) How would you describe the climate in your classroom? This was another exploratory question asked to determine how Mr. Jones viewed his own establishment of classroom learning environment.

(7) What can you tell me about yourself and your interests? Another question posed to learn more about Mr. Jones.

(8) What motivates you to do your job? This question was asked to determine Mr. Jones' own motivational mindset.

After the first formal interview, some key words were coded in his answers and some follow-up questions were developed for him. In the second interview the follow-up questions allowed a deeper discussion of his answers in the first formal interview.

Subsequently, in the next two formal interviews with Mr. Jones the researcher had a better idea of his teaching style and his personality. In the next two formal interviews he was asked to just talk about his strategies to motivate the students. He was also asked about the differentiated homework and how that worked.

Informally, Mr. Jones was willing to member check both the interview data and observational data. Through member checking the teacher provided an opportunity to correct any errors and challenge wrong interpretations of the data. He also provided additional comments and information during this process.

We met informally eighteen times over the ninety days for brief (five to ten minutes) follow-ups. Mr. Jones scanned the transcripts and discussed or clarified the collected data. The teacher offered additional insights on the students in his classroom and was aware of student behaviors that had been noted in the field notes.

Field Notes

Field notes were written immediately following every classroom observation and any interviews. These notes included comments on what was observed in the classroom and comments from students or the teacher that prompted what to look for in the future. Also noted were fire drills and impromptu announcements from the school's front office. The field notes were used during data analysis when casual factors were identified for what was observed. These included changes in class scheduling, fire drills, and any interruption of the regular class time. The field notes were also used to record certain patterns that were seen emerging in the observations. In Appendix A the similarities in approaches, behaviors, and commonalities in events are noted.

One pattern that was seen and recorded in the field notes was the use of scaffolding in the classroom. Scaffolding as Mr. Jones used it in his classroom was a learner-centered strategy that he adapted to each learner's needs. McLoughlin (2002) described scaffolding as more than student learning of concepts, but included strategies, procedures, and metacognitive skills. Mr. Jones provided strategies every day for individual students.

Further, Rogoff (1990) explained scaffolding as an adult providing metacognitive support to a learner. This support included manageable task segmentation, but not broken down to the point that the learner no longer felt participatory. Further, the learner would have contributed and recognized that contribution to the end result. The field notes for this classroom indicated that the students were given individual work based on their Zone of Proximal Development and each student was able to recognize his/her work's contribution to the end result.

The Zone of Proximal Development was critical to Mr. Jones in providing scaffolding that affected both the motivation of the student and that student's confidence. Mr. Jones (field notes) used a variety of strategies including models, demonstrations, and hints to scaffold his instruction. The scaffolding was geared to each student's ZPD or current ability level. In teacher interviews, Mr. Jones stated that it was his job to know each student's current ability or what they already knew and what they needed to know.

Further, Mr. Jones (field notes) addressed the emotionality of the student's individual tasks. He protected the student from ridicule by tying mistakes to learning. He modeled mistakes, admitted that he had made a mistake, demonstrated re-thinking to address the error, and moved on. He spoke to the class repetitively that mistakes were part of learning mathematics. He addressed mistakes as a necessary part of the learning process. He gave celebratory gestures (field notes) when the student answered the why of the problem-solving

and shouted “Yes!” Mr. Jones (field notes) focused on learner success and ignored mistakes.

Another pattern that was observed and noted in the field notes was the extensive use of modeling. Mr. Jones modeled the “easy” problem (field notes and observational data) every class period for 90 days. He modeled the problem at the beginning of the class period. He told the students that he would think through the easy problem and they could then solve the hard problem. In 60 days of class he modeled two easy problems before the students solved the “hard” problem. He modeled how he would solve the problem by thinking aloud about the problem. He had the students involved in each step of the problem solving process.

Mr. Jones (field notes and observations) used differentiation in his classroom for each class. He used differentiation for problem solving that he assigned for class work, board work, and homework. He stated (interview) that he knew what his students knew and he built on what they knew without frustrating them.

Another strategy noted in field notes was the real life problems that were tied to the students’ career field interests. Mr. Jones used information obtained from the school’s career counselor about the students’ career interests to present problems each day with those interests in mind. He tied the problems that were modeled and assigned to the individual students’ career fields.

Also, Mr. Jones used routine to regulate the climate in his classroom. In both field notes and observations, it was apparent that Mr. Jones had a consistent routine from the first minute of class. It was noted that when Mr. Jones had an

interruption of his class, he continued his routine and apologized to his students for the interruptions. These interruptions were changes in his schedule, fire drills, or photography day. He accepted the interruptions as necessary, but continued the routine of modeling problems, assigning problems with seatwork and board work. The students who left the class during the interruptions were given individual attention to catch them up and settled back into the routine.

Finally, Mr. Jones was observed providing strong encouragement to his students. Field notes of his routine commented on the welcoming of the students daily at the classroom door. Each student was spoken to by Mr. Jones and given a motivational phrase and a smile. The students responded to Mr. Jones in kind. They moved into the classroom and went to work. Mr. Jones used enthusiastic gestures and words to celebrate students' successes.

The field notes also a reminder of when there was a deviance from the usual in the classroom, for example, photo day when the students were called out for club photos and the class was interrupted several times. Mr. Jones (field notes) was not unduly agitated by these interruptions. He continued to teach the students who remained in the classroom. He approached each of the students as they returned to his classroom with a smile and a problem to solve. The students responded to this attention by getting right to work without a lot of time lost getting settled.

Data Analysis

In coding the data the technique of the grounded theorists (Strauss, Anselm and Corbin, Juliet, 1990; Glaser, Barney and Strauss, Anselm, 1967) was used

to look back at previous coded data and find comparisons that would effectively categorize this data. For example, axial coding was the process of relating categories to one another. This was done through both inductive and deductive thinking. This kept the coding consistent throughout the collection of data. Also coding included word repetitions by high-lighting, circling words with similar meanings, and even cutting and sorting the transcribed text to fit into categories. The use of axial coding to tie categories together was initially used. Grounded theorists emphasize causal relationships, and fit things into a basic frame of generic relations.

Initially the use of Atlas.*ti* in coding the data was helpful in establishing categories. Later it was decided to use an additional hands-on approach as a technique to feel more involved in the data sorting process. Therefore, a large number of codes were developed and then sub-grouped into smaller groupings. Then these data were “dimensionalize (d)” (Strauss, Anselm and Cobin, Juliet, 1990) into categories.

Each of the interviews was recorded and transcribed. The data were reviewed to identify themes or categories that were suggested by the students as influencing their motivation, perception, and attitude toward their achievement and the teacher. The data were fed into Atlas.*ti* to sort categories. Both the audio recordings of the interviews and the observational recordings were coded each day. The coding was based on what was judged to be about the same theme. Questions were asked about the data as it was sorted into the categories. Lofland and Lofland (1995, p. 186) suggested that the researcher ask “What do I

see going on here? What are people doing? What was happening? What kind of events are at issue here?" There was an examination of the categories from Atlas.*ti* and as the codes were created based on similar themes from quotations or even single words from interviews, this researcher established categories or families.

By additional daily examination and through reexamination of the categories there could be elimination or combination of those codes that did not fit. This researcher made notes to ask why certain pieces had been set up in particular categories. Once the data collection was completed, the data were physically moved around to visually look at these categories and how they would answer the research questions. Through the use of word repetitions, compared key words and categories to theories, and looked for synonyms to complete the task.

Once the themes had been identified, the task moved to axial coding to relate categories to each other. New codes were created when codes that did not fit the previous codes were found. All coded behaviors, events, activities, strategies or practices, relationships and interactions, deviance from the normal situation (fire drills or change of schedules), and miscellaneous were selected to be revisited. Later this researcher went into these categories and using index cards and scissors the quotes were cut and pasted to sort again. These index cards had quotes on one side and the date, speaker, context on the other side. These cards were left for several days before sorting them into themes again. A return to the cards and without looking on the back to identify speaker or context, they were placed by the quotes into themes. Once this sorting was accomplished, themes

were reexamined and the results were written. Using an analysis of word repetitions in the interviews, as well as synonyms, further data reduction pared the themes. Strauss (1992) and D'Andrade (1991, p. 294) encouraged the use of schematic organization with the "repetition of associative linkages".

The more formal analysis of word frequencies was done by listing specific unique words and counting the number of times each word occurred. Using computer word-frequency lists, these high frequency words revealed additional themes that were explored, resorted, and placed into categories.

Finding key words was obtained by systematically searching the student interview text, teacher interview text, observations, and field notes. Once the body of the text had revealed all the instances of the words or phrases, the themes were identified based on those piles of words or phrases with similar meaning.

Using the constant comparison method described by Strauss and Corbin (1990, p. 84) to "read the data line-by-line to determine how each sentence was similar to or different from the preceding data", data were sorted again. Bogdan and Biklen (1982, p. 153) recommended "reading the material and asking how the passages relate to the researcher's own experiences". Using observations, student interviews, teacher interviews, field notes, for data collection enabled triangulation of the data.

Trustworthiness and Dependability

The results emerging from the data (Lincoln & Guba, 1985) must provide credibility, transferability, and dependability. The researcher must have examined

biases and have the ability to report objectivity. Since credibility depended on triangulation of the data, this study had data sources that supported each other. The use of open-ended interview questions, observations conducted over an extended period of time, and the teacher interviews, field notes, and data collection provided triangulation and support of the trustworthiness of the findings. The transferability was approached by providing the thick description that enabled the reader to determine transferability. The third point for qualitative research was the dependability. This study provided both reliability and dependability by providing consistency and stability with the findings remaining the same over two semesters. The students' and teacher's perceptions should have remained stable over the course of the study, in the absence of significant events of which none were identified during this study. Finally, the confirmability of the researcher was acknowledged in an examination of personal biases, allowing the students and teacher many opportunities to express their own perceptions, and by member checks.

Summary

In this chapter the researcher offered the rationale for the qualitative case study based on the nature of the research questions. The rationale was to gain detailed information "to develop an understanding of a complex phenomenon as experienced by its participants (Gall et al., 2003, p. 438). A descriptive case study was chosen to conduct an investigation within a natural context (the mathematics classroom) using multiple sources of evidence (Yin, 2003). The four

sources of information for the study were outlined in the chapter: observation, student and teacher interviews, field notes, and achievement data. By using methodological triangulation or more than one method to gather data, both credibility and trustworthiness of the results were achieved.

Included in the chapter was an explanation for the use of the descriptive case study approach, the setting of the school in the district, the classroom layout, the participants (both teacher and students), and the competencies expected for the Algebra I curriculum. The classroom observation schedule was discussed with 135 hours of classroom observations. The open-ended interview (Patton, 2002) was used with each of the student participants. Additionally, fourteen (14) students were asked for a follow-up interview based on their answers to the first interview. The follow-up interviews helped to clarify some answers, member checks on their responses, or follow up on the lack of detail or the considerable detail provided by them. The teacher was interviewed four times and informally eighteen times during the semester.

Also, details of the data analysis including how the data were coded using first Atlas.*ti* and then key words, repetition, and the cutting and pasting on index cards of quotes and then sorting was described in the chapter. Further, the use of highlighting, identifying key words and phrases, cutting key quotes to paste under themes by reading and re-reading the text was discussed.

The classroom diagram indicated where the Smart Board was placed in the room with reference to the student desks. The observer was seated near the assignment board and could view all the students, teacher, and the responses of

the participants. Data analysis included observations, field notes, teacher interviews, student interviews, and some achievement results.

In Chapter IV the researcher will present the results of the data analysis. These results were obtained from the analysis of the data collected through observations, interviews, field notes, and some achievement results.

Finally, in Chapter V the discussion will examine the results of the findings. Further, conclusions by the researcher and direction for future study will be explored.

CHAPTER IV: RESULTS

The results of the data analysis are presented in this chapter. As detailed in Chapter III the data were collected from 90 classroom observations, interviews, achievement data, and field notes. This extensive time frame allowed the observer to obtain a clear depiction of classroom practices. Additionally, nineteen interview transcripts were analyzed from open-ended student interviews. An additional fourteen student interview transcripts were analyzed to either clarify or enrich the student data. Further, both formal and informal teacher interview transcripts were analyzed to provide a rich description. The daily field notes were used to triangulate findings, though the field notes were repetitive due to the routine followed by Mr. Jones in his classroom.

The purpose of this study was to explore what the students and teacher reported that led to success or failure in the Algebra I for high school credit course. An additional desired outcome was the specific teacher strategies used to teach the students. The results of the analysis of the data collected in Chapter III were reported in this chapter. The analysis will be presented around these research questions. The research questions were:

(1) What role do students in this Algebra I class report their teacher plays in their academic success or failure?

(2) What does the teacher report he does that leads his students to success or failure?

(3) Which teacher strategies influence students to learn Algebra I?

Research Question One

Emerging Themes

Research question one asked what role students reported their teacher played in their academic success or failure. The themes that emerged from the student interviews and both observations and field notes were scaffolding, modeling, differentiation, and real-life problem solving. The key words and phrases that are illustrative of scaffolding are illustrated in the following table:

Table 4

Students' key words and phrases Illustrative of Scaffolding

Student #1, Student #5	Reminding me of what I already knew and building on it. He like reminds you of what you learned already. Then he has you keep going.
Student #2, Student #19	He has me repeat what I learned last semester and then has me build on what I already knew. He says, "Say it, and say why!" So I'm telling him what I know. He has me think and remember and say what I already know. Then he brings up something else to add on to it.
Student #3, Student #12	It was crazy, he just makes you think and remember and give him answers. You keep going

	until you get there.
Student #4, Student #17	Well, he tells me to back up and it comes to me. Then, I am saying more and more about it until he says, “Yes!” He tells you to stop, back up, think, remember and tell him why.

Scaffolding

In education, scaffolding was a metaphor for a structure that was put in place to help learners, (Wood, Bruner, & Ross, 1976). However, scaffolding was a learner-centered strategy tailored to specific learner needs based on their ability and interest. Rogoff (1990) described scaffolding as an adult breaking down tasks from those that are beyond the learner’s abilities into smaller, more manageable chunks within the student’s reach.

The students reported their teacher’s use of scaffolding or building on prior knowledge throughout the interviews. The theme of scaffolding emerged because the students responded in interviews that their teacher had them repeat concepts and build on those concepts in the lessons. The students remarked that he picked up past learning and moved them beyond what they already knew to new knowledge.

Eighteen students mentioned that he reminded, had them recall, had them repeat, urged them to remember, and used prior learning or past work to build on their knowledge. When students were asked, “Do you believe that you are learning in the class? How? Why?” Four students stated that Mr. Jones used

“backing up to review past concepts,” “reminded us of what we knew before we started work on the problem,” “made me say what I knew before we started working the new problem,” and “always tells you to back up and remember what you already knew.” Seven students stated that Mr. Jones insisted on “repeating old facts that I learned last year,” “reminding me of things I did know before,” “saying why I should use that way to solve because of what I knew before,” “repeating old stuff,” “using information I knew last semester,” “don’t jump ahead of myself,” and “using what I already know to get to the answer.”

Other students discussed how they were learning in the class. “I’m learning because Mr. Jones makes us repeat old things over and over,” said one student. “I believe I’m learning because he (Mr. Jones) knows what I know and what I don’t know and teaches me what I need to know.” Two students remarked on Mr. Jones’s insistence on “making us recall old stuff” or “going over and over things we should know already” and even “adding to what we know with new information.”

Seventeen of the students shared that Mr. Jones began class with reminding them of prior learning. He used scaffolding instruction as defined by Bruner (1975) “the systematic sequencing of prompted content, materials, tasks and teacher support to optimize learning.” This method was so routine that he often did not have to ask the students to repeat the rules, but students automatically began the problem-solving by reciting the rules.

During observations, scaffolding was evident in the lessons. The teacher insisted that students build on prior knowledge when he asked them to tell him

the rule, the order of operations, and why the answer was correct. The students reviewed the order of operations with the problems.

Every observation began with the teacher at the SmartBoard doing the “easy” problem so that students could then do the “hard” problem. In fact, the teacher had the students doing both problems. The students and teacher had a dialogue that had Mr. Jones actually stating the problem and writing it on the SmartBoard. The students were then presented with a request to explain what he should do. The problem had steps that students began. Each time a student responded, Mr. Jones inquired, “Why?” The student then explained the order of operations or Mr. Jones would coax out the answer by reminding them of prior knowledge. Once the students reached the actual learning goal or knowledge that was new to them, Mr. Jones would add to that knowledge.

Since scaffolding was the support of students so they could cope with the task situation, this strategy also entailed a gradual withdrawal of the teacher from the process so that students could manage on their own. As Mr. Jones led the students to the knowledge by guiding them through the “easy” problem, he also gradually withdrew from the process so that the students tackled the “hard” problem with confidence. The students did not appear to recognize that the problems had similarities in difficulty.

Modeling

A second theme that emerged from the data was modeling. Cognitive modeling was explained by a teacher modeling a decision-making process by working and talking aloud about the concepts and the rationale. The student

would not use direct imitation (as in behavioral modeling), but used strategies similar to those modeled by the teacher. In the constructivist view (King, 1999) learners observed and followed strategies used by others working on similar problems. This cognitive form of modeling allowed the learner to apply the learned knowledge and construct his/her own knowledge in a different setting (Cooper, 1999).

For example, the students explained how the teacher modeled the problems for them each day. This teacher modeled his own thinking skills and allowed the students to use guided practice to solve an additional problem. Modeling was exhibited in the lesson for either five or seven problems per class period. This technique was not repetitive because the students were observing a cognitive process (including problem-solving mistakes). The students also had guided practice after the initial problem was modeled in doing an additional problem with guidance. Therefore, either ten or fourteen problems were modeled together each class period. This technique allowed students to use metacognition in problem solving so that they could identify what they already knew and what they didn't quite understand. Metacognition consists of three basic elements: Developing a plan, maintaining or monitoring the plan, and evaluating the plan (Biemiller & Meichenbaum, 1992).

Mr. Jones, in a formal interview, reported that he developed a plan for each learning goal and the objectives that were expected in the standard course of study for Algebra I. He stated that he then monitored his plan to make sure that he did not move too fast. Further, he did daily evaluations on the state of the

students. He modeled how to learn and developed his plan through the daily results he saw in his students' responses to his efforts.

In 30 observations, the teacher began the problem-solving by asking himself aloud "What do I already know?" "Where do I want this thinking to take me?" and "What should I do first?" This exercise in learning how to learn was done aloud and engaged the students. The teacher modeled his own thinking skills.

In his next stage of modeling, he asked himself "How am I doing?" "Am I on the right track?" and "Should I continue or move in a different direction with this problem?" Finally, he evaluated what he had done by asking aloud, "How did I do?" "Did I produce the solution?" "How would I use this thinking to solve other problems?"

Table 5

Solution Modeling reported by Students

Thinking with Us Sometimes making mistakes while he was working on the problem.	Showing us how to start Showing how to solve
Doing the easy one	Demonstrating
Watching the way he works	He watches us work the hard one

Table 6

Observations of Cognitive Teacher Modeling

I'll show you the easy one.	You can do the hard one.
Teacher begins with how he would	Teacher thinks aloud and invites

begin thinking about the problem.	student participation.
Teacher does a trial solution that may be incorrect.	Teacher explains why mistakes are part of problem-solving.
Teacher provides another way of thinking about the problem's solution.	Teacher works through the thought process of the correct solution.

In student interviews the students used the words: watching, working with you, showing you how to solve, showing us how, thinking with us, doing the easy one so we could do the hard one. When students were asked if the same routine didn't get boring, they were surprised by the question. Three students thought this class was the fastest class they had. They admitted to being totally engaged with the modeled problems. According to more than one-half of the students, the teacher did the easy problem and had the students do the hard problem.

Real-Life Problem Solving

Since students compartmentalize learning, many mathematics students are unable to associate problems in the text to real-life situations (Hill and Jones, 2005, p. 19). One reason proposed for this failure to transfer was that problem solving and learning have not taken place in real-world contexts (Hill and Jones, 2005, p. 19).

The career counselor had furnished the teacher with the career interests of each of his students at the beginning of the school year. This teacher worked up problems that would actually be experienced in those career paths and modeled them. Some examples of the problems included:

Mr. Jones used this real-life problem: a disc jockey (one of the student's career choice) must play 16 commercial spots during a 1 hour radio show. Each commercial was either 30 seconds or 60 seconds long. If the total commercial time during 1 hour was 13 minutes, how many 30-second commercials were played that hour? How many 60-second commercials? So, what should I put up here?

Students responded:

Let x = the number of 30 second commercials.

Let y = the number of 60 second commercials.

Mr. Jones: Great! Now the disc jockey has to play 16 spots in a 60 minute show. What do I put up next?

Students responded:

16 commercial spots 13 minutes =60 x 13=780 seconds

Mr. Jones wrote the formula on the SmartBoard as students dictated:

30x + 60y =780

(Substitution 16-y for x)

30(16-y) + 60y = 780

480 - 30y + 60y = 780

480 + 30y = 780

30y = 300

y = 10 if y=10, x=6

Mr. Jones: So, the answer was?

Students responded:

So, 6 30-second commercials and 10 60-second commercials

Mr. Jones (threw his fist into the air): Yes!

The students believed that the teacher was solving problems from their own career paths and were problems they would encounter in the real world. The students honed in on the problems since those problems represented real-life situations that they believed they would encounter in their own careers. Real-life problem solving emerged from the observations as well.

Table 7

Careers students listed as of future interest

Architect	Mortician	Disc Jockey	Fashion Model
Chemist	Teacher	Reporter	Photographer
Doctor	Hair Stylist	Sports Star	Police Detective
Administrative Assistant	Lawyer	Bail Bondsman	CSI
Accountant	Pharmacist	Pilot	Military

Another example had questions applied to the career of the architect: What about windows? How many sq. feet per wall? 567. How much heat will build up in the rooms because of the windows? That will affect how much air conditioning you need. Also windows leak heat during the winter so more of them means more heat too. How many electrical outlets do you need? How many amps do you need from the power lines? How many circuit-breakers? How many lighting

fixtures do you need? In modern buildings, the lighting system was considered part of the heating system--which was why you see lights on in skyscrapers in the middle of the night when nobody was there.

How do pilots use mathematics? What distance was needed to get your plane off the runway? What calculations will you need to use if the wind speed was high and against the airplane? Was the weight of the plane important? Why?

Police detectives use mathematics: Where was the victim standing when he was shot or stabbed? How fast was a car going when the brakes were applied? What would the length of the skid marks have to do with the speed of the car? The students never asked after their questions were answered about how they would use mathematics in their chosen careers.

In the categories gathered from observational data, Mr. Jones used the careers in Table 6 above consistently to illustrate real-life mathematical problem-solving. The students' career paths were used in real-life problems seventy-six times over 135 hours of observation. The students recognized when their own career choices were used to illustrate problems in real life situations. The use of real-life mathematical problem-solving encouraged the students' interest in the daily lessons. In student interviews, the teacher's use of their own career interests was commented on by students repeatedly.

Differentiation

Each student was aware that their teacher gave different problems and different homework to them. Throughout the student interviews, fifteen of the nineteen students commented on differentiated or "different" homework and

seatwork problems. Fourteen students were asked how they felt about getting different assignments or problems to solve. For example, nine students believed that their teacher knew what they could do and assigned the work to them based on that knowledge. Four of the students believed the differentiation was assigned to prevent cheating or copying answers from their friends. One student admitted that he had no idea why his homework was different and didn't care because it was something he could do. Every student reported that the homework was something they could do and that if they had trouble they could ask Mr. Jones the next morning.

According to the teacher interview, students were given different problems based entirely on what the teacher believed they could solve at home without assistance. The students, "for the most part," did not have parents who could assist them at home. Also, the teacher believed that homework was practice of what the student had learned that day in the classroom and should be easily accomplished at home. The career problems given as real-life problems were also based on the different interests of the students.

Research Question Two: What does the teacher report that he does that leads his students to success or failure?

Emerging Themes from Research Question Two

The emerging themes from the second research question included scaffolding (students had also supported), modeling (again developed in research question 1), and strong encouragement or his belief in the students' teachability. Perkins and Solomon (1989) recognized the aspects of metacognition in scaffolding and

problem-solving. Mr. Jones constructed a cognitive scaffolding approach to solving the problem with the students. In 135 hours of observations, Mr. Jones used this cognitive scaffolding approach with his students for one-fourth of each classroom period. Forty demonstrations of the scaffolding approach resulted in mistakes in the problem-solving process and the students were told that "mistakes are part of learning or solving problems". This was repeated after any mistake that Mr. Jones made or that any of his students made.

The teacher's initial interview revealed that he believed his role was not as critical to student success as the observations and student interviews indicated. He was modest and self-effacing in his responses to interview questions. He believed that all teachers should know the students' knowledge base before beginning the teaching process. He had armed himself with individual student knowledge with previous mathematical scores and the career interests for each. The teacher thought that he should know what the students know and help them build on it. So, this insight from the teacher supported the theme of scaffolding or cognitive scaffolding for the students. Also, he remarked that he always does the 'easy' one and they do the 'hard' one, while he taught that mistakes are an essential part of learning.

The teacher believed that teaching the "why" was a major job for him. He wanted them to know the concept and not just the right answer. His cognitive scaffolding and modeling provided the students with the map to problem-solving.

Again, he mentioned that he was their biggest fan and he asked them to try just one piece of it if they felt discouraged. He let them know that mistakes were

part of learning. He stated that he made mistakes to show the students that mistakes helped lead to the correct answers. This was noted forty times in the ninety days of observations.

One remarkable theme that emerged was his strong belief in the students and their ability to learn mathematics. In seventy-five observations and in field notes the teacher used enthusiastic gestures and signs when students attempted solving problems presented to them. His rhetoric was positive throughout all 135 hours of observations in the classroom. His positive statements were recorded in the four formal and eighteen informal interviews. He stated repeatedly that he gave them faith in themselves and that he bragged on them to their faces and to their parents and to other teachers. He reiterated that he believed in them and let them know his strong belief in their ability.

Finally, he told of his encouragement to the students. He remarked that he asked them to persist and never give up. In the observations and field notes his strong encouragement to his students was noted. His positive attitude when he threw his fist into the air to shout, “Yes!” The words of encouragement offered to each student as they entered his classroom. His belief in the students’ teachability was observed as he led them through the ‘easy’ problem so they could solve the ‘hard’ problem. The data from the student interviews also supported Mr. Jones’s assertions that his students were teachable and that he could support their autonomy to learn mathematics.

Mr. Jones used key words and phrases in his answers to the interview questions that were repetitive. He stated,

I *believe* in them. I *know* they *can* learn the mathematics. I show them they *can* do it. I make sure they *believe* in themselves. I am their *biggest fan*. I ask them to just *do* a little piece of it and I will help them. I only give homework that I *know they can do* alone. I think homework should be practice for what I *know* they already *know*. I teach them that mistakes are part of problem solving. I have *faith* in them. I tell them they *can do it*. I *believe* if they *will do* just part of it. I *know* they want to learn it. I give them individual problems based on what I *know* they *know* to practice. I want to *build* their self- confidence. I tell them *to try* and they *can do it*. I remind them of what *they can do*. I tell their parents *they can do it*. I stay positive and let them see I *believe* in them.

Research Question 3: Which teacher strategies influence students to learn Algebra I?

Emerging Themes for Research Question 3

The following table shows the strategies supported by the data from student interviews, teacher interviews, data collection, field notes and observations. There were six themes that emerged: routine, extensive cognitive modeling, scaffolding (cognitive), differentiation, real life examples, and strong encouragement.

Table 8

Teacher Strategies in the classroom

Strategies	Student Beliefs	Teacher Beliefs

Routine	Knowing what was expected was important. Always thinking aloud and working makes work easier.	Provides structured environment that offers safety and promotes student learning.
Extensive Modeling	He shows us how to do it with the “easy” one.	I model similar problems and have them think aloud about the steps to solving problems.
Scaffolding	He wants us to repeat what we already know. We tell him why we solve a certain way based on what we already knew and he gives us more.	Every problem requires that students have the ability to build on prior knowledge. I build their knowledge base.
Differentiation	He gives us different homework and different problems to solve.	I believe that homework was just practicing what one already knows. Each student has a different fund of knowledge.
Real Life Examples	He gives us problems that we may encounter in	I made an effort to find out what interests and

	our own career paths.	career paths each student has. I use these real life examples.
Strong Encouragement	He gives us a pep talk before class, during class, and after class. Sometimes it was just one word. In class, he throws up his fist and shouts, “Yes!” when we get it right. I feel like throwing up my fist and shouting too. He lets us know that we can yell out when we are doing it right. I know he cares about me or about my work because he called mama and told her how hard I worked in his room.	I show my enthusiasm for learning. When the students come into the room, I give them a few words of encouragement. During class I get excited for them when they try and get it right. I often yell out, “Yes!” I tell everyone how great they are. I tell them how great they are, their parents, their teachers and counselors.

The teacher had a strong belief in the teachability of his students. Throughout the observations and interviews his belief was noted in observations and field notes that he knew the students could learn. The students also echoed the belief that they could learn from their teacher. The words that he spoke to each of his students before class each day indicated a belief in their teachability. For example, “Let’s work!” “Just do it!” “Go, girl!” “Let’s go!” “Get in attack mode, guy!” The modeling of the “easy” problem with the assurance to his class that they could do the “hard” problem was an example of his belief in the class.

So, his encouragement and extensive modeling created a belief in the students that they could learn. His little slogans that encouraged the students before they even came into the room set up an atmosphere of serious learning and a “do it” attitude. The extensive modeling assured the teacher that the student followed the correct order of operations and more importantly understood the concepts as they attempted the problems.

His use of routine gave the students both a sense of security and freedom to make mistakes in a safe environment. In 90 days of observations, Mr. Jones stood at his classroom door every day to repeat those enthusiastic little words to his students as they entered his room. In 90 days of observations, when the school bell sounded, Mr. Jones went immediately to the SmartBoard to get to work. Every single observation had Mr. Jones immediately setting up a problem based on a career path of one of his students and this was always referred to as the “easy” problem so that the students could solve the “hard” problem. Mr. Jones in 74 of the 90 observations made mistakes in his work. In 47 observations

the students caught the mistakes and 27 times Mr. Jones caught his own mistakes. However, 74 times Mr. Jones repeated, “Mistakes are part of learning.” “Oh, that’s okay, because mistakes are part of learning.” This safe environment was created by the teacher through his own willingness to make mistakes, accept mistakes from others, and expect mistakes in himself and his students. He used real-life situational examples for the extensive modeling and based the real-life examples on the career aspirations of his students. This personalization of the work offered the students both differentiation and encouragement. The teacher’s enthusiasm for his teaching task was infectious. His students were also enthusiastic and carried the enthusiasm for mathematics home to their older siblings. This teacher worked beyond the standard course of study to take Algebra I out of the standard course of study box and made it real. He did this by using the students’ own career goal choices as problem-solving examples.

Mr. Jones worked beyond the standard course of study outlined by the state and the curriculum guides provided for all mathematics teachers in the school system. This practice of going beyond the standard course of study for Algebra I was mentioned by the mathematics coordinator for this school system. He indicated that Mr. Jones often taught mathematics unrestricted by what the course required. The mathematics coordinator did not necessarily believe that this was a good thing. His reasoning was that the students should learn mathematics in the ‘chunks’ that it was divided into by the state and not studied beyond the outlines provided by the curriculum.

Five students interviewed mentioned that Mr. Jones not only taught mathematics, but actually used and enjoyed mathematics in his old job. This seemed to make a difference in their view of learning mathematics. When any mathematics problem went beyond the ‘boxed’ standard course of study for Algebra I, Mr. Jones went beyond the standard course of study to solve those problems with the students. Two students mentioned that they were able to assist their older siblings with higher level mathematics courses. When the students were asked to elaborate in a second interview on what they had learned from Mr. Jones, one student said, “I learned more than my sister in high school Algebra II. She can’t do the problems without asking me to help her. I’m just in Algebra I, but I can do her problems.” Another student mentioned that his sister asked him for help with her high school math problems as well. “She doesn’t have a good teacher, I guess.”

Summary

This chapter began with the results of the data collection. The three research questions served as the framework for the findings. The first research question asked:

1. What role do students in this Algebra I class report their teacher plays in their academic success or failure?

The students reported that their teacher played a significant role in their academic success. They mentioned the scaffolding of prior knowledge to connect to new material. The differentiation of homework was an emerging theme. The students loved the modeling of ‘easy’ problems so they could work the ‘hard’

ones. These students appreciated that the teacher used real-life problems (even related to their own career path choices) for the modeled problems.

2. What does the teacher report that leads his students to success or failure?

The teacher reported that he led his students to success through more affective skills such as encouragement, belief in their teachability and a positive attitude. He also mentioned his strategy of scaffolding, modeling, and making sure the students knew 'why' or the concepts of his lesson.

3. Which teacher strategies influence students to learn Algebra I?

One measure of teacher and student success in this school district was the end of course tests given after successful completion of the course work. So, which teacher strategies influenced these students to learn the coursework? Did those strategies measure successful in Mr. Jones's class by the standards of the district? To determine the answers, this researcher looked at all the sixteen middle schools that were defined as FOCUS schools (Finding Opportunities Creating Unparalleled Success). These schools had similar student populations and high-poverty information. The FOCUS schools had additional resources and support that included smaller class sizes, additional resources and supplies, and monetary incentives for teachers. A middle school in the same geographic area had similar students to the study school. The teacher in the similar school had five years experience and was not a lateral entry teacher, but had graduated from an accredited school of education with a major in mathematics. This choice of another FOCUS school's results was based entirely on the details of similar

school population, similar ethnicity of students, past achievement scores in mathematics for seventh grade, and not observational data. Neither the teacher nor the students were interviewed at the comparison school and all data was gathered from the Central Office of the school district's files.

An independent samples t-test showed that Mr. Jones's class (M = 165.79, SD = 7.57) outperformed the comparison class (M = 153.68, SD = 7.36), t (36) = 5.00, $p < .001$. The effect size of this difference was large (Cohen's d = 1.62). The variances of the two classes were close to each other.

This analysis of the data for the three research questions provided four themes for the first research question: The themes revealed through data analysis were scaffolding, modeling, differentiation, and real-life problem solving. These students believed their teacher played a significant role in their academic success.

In the second research question: The teacher reported that he led his students to success through more affective skills such as encouragement, belief in their teachability and his positive attitude. The data analysis revealed scaffolding, modeling, and encouragement or support of their autonomy as further strategies.

In the last research question: The data analysis of student interviews, teacher interviews, observations, field notes, and data collection found that routine, extensive cognitive modeling, scaffolding, differentiation, real life problems, and strong encouragement supported the students in learning Algebra I for high school credit.

CHAPTER V: DISCUSSION

In this study the teacher and the students were observed daily for eighteen weeks or ninety days in a mathematics classroom to determine how these students perceived their teachers' role in their academic success or failure. The expectation was that the students would give the teacher little credit for their success and all the blame for any failure. What a surprise to learn that the students recognized their teacher as a strong influence. By using Patton's (1990) open-ended interview technique with all the students' questions standardized, it was found that the comparability of the responses indicated the teacher used scaffolding daily, often worked beyond the standard course of study, used real-life situational examples, extensive cognitive modeling, and differentiation. The students' responses characterized the teacher as showing enthusiasm for the task, a strong belief in their teachability, consistent humor and daily encouragement. The emerging themes from the students about how they believed their teacher helped them to succeed were: scaffolding, differentiation, modeling, and real-life situational problems to solve.

The research was started with the premise (Christophel, 1990; Council of Great City Schools, 1987; Cruickshank, 1990; Faber, 1991) that effective teachers motivated students or supported their autonomy to learn. The students were asked what part they believed their teacher, Mr. Jones, played in their

academic success. The teacher, Mr. Jones, was asked what part he did that led the students to success. Finally, the teacher strategies that were employed were observed and recorded.

Observations

During these observations it was noted (observations and field notes) that the teacher performed the same routine in the 90 classroom days. This repetition provided a sense of security for the students. Mr. Jones's routine varied only when his class schedule was disrupted by a school function (student photographs, fire drills, or assemblies). Students wasted little time in getting into their seats and preparing to work because in every observation, Mr. Jones went to work when the bell rang.

Also, Mr. Jones engaged the whole class in problem solving. The observation field notes indicated that every lesson, except the lesson on the Monday morning after the Super Bowl, the students were attentive and participatory. In that lesson, Mr. Jones addressed the students' inability to concentrate concerning the late hour of the Super Bowl. When a student asked him if he had watched the Super Bowl, he responded that the Super Bowl had watched him as he had fallen asleep during the game. This humor appeared to engage the students and re-energize them to take part in the lesson.

In the first few observations this researcher did not know that Mr. Jones was using real-life situational examples drawn from the students' career paths. After each observation, followed by a short walk down the hall to the counseling office where the data was transcribed. The school career counselor commented that

Mr. Jones had met with her when he received his class list to explore each student's folder and jotted down the career paths and interests of these students. Mr. Jones confirmed that he considered that a way to keep students engaged.

The students were engaged. Mr. Jones exhibited and declared a strong belief in the teachability of his students. The classroom was not set up as competitive, but the game was on every day. The students answered what he asked. The students cheered for themselves when they got the right answer. The teacher modeled the enthusiasm for even partially correct answers by his facial expressions (joy) and shouted "Yes!" when the student finally arrived at the right correct answer. The students learned to also shout, "Yes!"

Teacher Interviews

So, what constitutes an effective teacher? The teacher knew his subject well beyond the standard course of study. He had lived the mathematics in his engineering job and could apply the mathematics to real-life situations in career paths chosen by his students. This teacher realized that the students were middle school aged and required the application of mathematics to their own interests to hold their attention.

In one interview Mr. Jones commented that he had attended a brain research institute training during the summer prior to his first school year teaching at this middle school. He stated that he wanted to know how middle school students think and learn (Jensen, 2008). Some of the lessons incorporated into his classroom included: Classroom Environment (incorporating humor) and Instruction (opening lessons by telling students what they will be taught and why

it was important, brainstorming, question and answer sessions) and the use of cheering to generate movement. This brain-compatible classroom was one that Mr. Jones sought in his own classroom. He learned that immediate, positive feedback was important. Another tenet was the importance of safety in making errors in the classroom without being ridiculed.

The constructivist approach (Bauersfeld, 1995) was concerned with the learner as an individual requiring the instructor to make sure that the learner has confidence in his/her ability to learn. Mr. Jones expressed his concern for each of his students in his words of encouragement (each student had an individual "just do it" phrase, his decision to use individual student career paths for examples, and his continuous dialogue with his students. Just as Jonassen's (1994) fifth principle explains the negotiation that unites the teacher and the students with a common goal, this unity was observed in the classroom. Without a sense of competitiveness, the students and teacher constructed new meanings.

Student Interviews

The students commented on their teacher's willingness to give different homework and that the homework was something they could do without assistance. Students knew that Mr. Jones was concerned with them as individuals and that he cared about whether they learned in his classroom. The mastery goal orientation encouraged differentiation and scaffolding to take the students to the Zone of Proximal Development and beyond. With the differentiation, the students then reflected on their individual progress with worthwhile assignments rather than on the struggle of not quite "getting it."

Von Glasersfeld (1989) identified this confidence (seen in these students) as what sustained the learner's motivation to learn. Based on Ryan & Deci's three factors those encouraged students to learn: competence, autonomy, and relatedness, this instructor boosted the students' feelings of competence and autonomy while applying relatedness to the Algebra I problem-solving. As the mini-theory of Cognitive Evaluation showed that autonomy-supportive teachers tend to pique the curiosity of the students, this was evident in Mr. Jones's classroom. The instructor became the facilitator to move the student to his/her own understanding of the subject matter. Thus, the teacher was in a continuous dialogue with the learner (Rhodes & Bellamy, 1999). Mr. Jones facilitated by asking rather than telling. The continuous dialogue was not a continuous monologue (DiVesta, 1987). The ninety minute classes went by swiftly for the students, as they mentioned in the interviews, for they were busy dialoguing with their facilitator and constructing new knowledge. However, dialoguing was not all that went on in this classroom. Students reported when someone knew the "why" for the equation, the entire class would pump a fist and scream, "Yes!" The students celebrated victories because Mr. Jones celebrated victories—even small ones. While victories are celebrated, there are no worries when mistakes are made. Also, students reported that mistakes are viewed as part of learning, so if the student (or teacher) made no mistakes, he/she just couldn't be learning anything. So, mistakes were just fine!

The mastery goal orientation viewed mistakes as learning opportunities. Students are encouraged to make mistakes in their attempted learning. The

teacher modeled the view that mistakes were part of learning and that his classroom was a secure place to make mistakes.

Field Notes

Using differentiated instruction requires instructors to tailor instruction to students' needs. Teachers committed to this approach concentrate on *who* they teach because who the students are shaped how they learn. Using differentiated instruction required the teacher to have "sufficient appropriate knowledge of the pupils, plus the ability to plan and deliver suitable lessons effectively." (Allan & Tomlinson, 2000). This did not mean that the teacher crawled along so that everyone could keep up, but offered an active, student centered, and meaningful approach to learning. The three keys of differentiated instruction provided by Allan and Tomlinson (2000) were readiness, interest and learning profile. Vygotsky (1978) provided a theoretical influence when he proved that students learn best when they are ready to do so. This readiness involved what the students knew, how they learn, and how they demonstrated knowledge. Bruner (1996) declared that the more autonomous learner was one whose interest had been captured. Gardner (1999) supported the third key of tailoring the material for different learning profiles.

The integration of constructivist learning theory, learning styles, and brain development are part of differentiated instruction (Anderson, 2007). Because of the heterogeneous groupings in the classrooms of today, differentiation influenced students' readiness, interest, and motivation in the classroom.

The climate in the room was so positive. The ninety minute class was over and it seemed it had just started. The students seemed reluctant (field notes) to leave the room. As I left the room and walked down the hallway to transcribe my notes, I wondered how I could capture in words the emotions of that class. I decided words that would describe an exciting adventure could come close.

The teacher encouraged intuitive thinking (Ackerman, 1996; Brown et al., 1989) in his students and they obliged him because mistakes were an acceptable part of learning. McMahon (1997) underlined the importance of viewing the whole rather than compartmentalizing knowledge. He knew that students could not learn if only a piece of the knowledge was presented to them. In order to fully construct and problem solve, the learners needed the whole resource.

Duffy and Jonassen (1992) stated that in the constructivist view, the foundations of any subject may be taught at any stage, but the basics should be built upon repeatedly. Mr. Jones insisted that students continually revisit the concepts and build upon the “why” of the problem-solving in order to move beyond the basic and retain the knowledge. This teacher’s view that he needed to know what each student’s knowledge base was and supported them as they built on that base. The right answer was not as important in the facilitation process as the ability to know “why” one should use a certain operation.

The field notes on scaffolding included how it affected learners both cognitively and emotionally, impacting learner motivation and confidence when approaching a task (Bean & Patel Stevens, 2002). Also, avoiding students’ experiencing feelings of failure made it essential that the scaffolding was directed

to the learner based on his or her current knowledge state; but at the same time not be so challenging as to be unattainable. The Zone of Proximal Development (Vygotsky, 1978) was a region that was just beyond the student's ability level. As learners gained new skills, the zone of proximal development moved so that the space between actual and potential achievement was assessed through social interaction between the student and teacher (Rogoff, 1990).

The notes on real-life problem solving or authentic learning were (Rogoff, 1990, p. 24) "based on a constructivist philosophy where learners construct their own contextualized knowledge." The instructor "actively engages learners in authentic task, activities…where social negotiation of meaning was required in the problem-solving process." This approach resulted in retained knowledge and more meaningful metacognitive strategies to learning. The teacher served as a guide to probe for understanding, supported the attempts, and identified gaps in prior knowledge (Barrows and Myers, 1993). Other researchers (Phillips, 2000; Richardson, 2003, p. 1624) described social constructivism and psychological constructivism "the two forms are beginning to come together with a focus on the social aspects of classrooms." Richardson (2003) made a clarification about the teacher knowledge necessary in constructivist pedagogy. Most research in constructivism has investigated student learning, but Richardson (2003, p.1636) advocated for research in (a) the relationship between teacher beliefs and values; (b) constructivist teaching because little research had been done here; and (c) the cultural critique of the pedagogy which "may take us beyond constructivist pedagogy."

Motivation has usually been considered essential for positive learning to occur. Many researchers have addressed student motivation (or its absence) in school. White (1959) noted that in school, that drive for survival was achieved by students becoming competent in matters of concern to themselves. This social concern was posited in the literature, but not evident in the classroom of Mr. Jones. All students were concerned for themselves and each other. Mr. Jones promotion of the mastery goal orientation assured there was no competitiveness evident in the classroom. He used real life problems associated with each student's career goal that assured and encouraged individuality rather than grade competition.

Since Goodenow (1993) found a positive correlation between academic effort and achievement to teacher autonomy support, the research of Deci and Ryan (2000) found that students' acts are motivated by many different factors, but competence, autonomy, and relatedness are essential. This motivational theory focused on how students were affected by social and cultural factors in the classroom. The teacher must connect the feelings of competence, autonomy and relatedness to the subject matter, in this case, mathematics.

Conclusions

This study had implications for future research for how to engage students in mathematics. The high-poverty students at this low performing middle school had a 100% success rate in passing the Algebra I (for high school credit) end of course test. This classroom in this particular school was the only low performing

middle school in the district where 100% of the students passed the state end of course tests in Algebra I for high school credit.

The data collected from students, teachers, observations and field notes in concert with the end of course achievement data provided clear evidence that this teacher's strategies worked in his mathematics classroom. Those strategies included: (1) The use of real-life situational examples that kept the students' interest and provided a connection to their own career path choices; (2) extensive cognitive modeling of those real-life problems with facilitator dialogue with the students that kept all students engaged and participatory in the learning process; (3) the routine followed in the classroom that created a secure climate that encouraged the students to both make mistakes and celebrate successes; (4) scaffolding provided for every problem assured that the students knew the 'why' and not just a correct answer; (5) differentiation of homework assignments allowed each student to practice learned concepts without the frustration factor, and (6) the strong use of encouragement kept the students' morale at a high level throughout the ninety minutes of class.

The achievement data of all nineteen students at the end of the semester supported the findings. Long-term studies of mathematics classroom (Rousseau & Tate, 2003) have supported that teachers who know not only what students know, but how they think and reason, are more effective. In the Professional Standards for Teaching Mathematics (NCTM, 1991) teachers needed to understand how mathematics was connected to the learner's life.

After this study was completed, there was some discussion of the brain-based research class taken by Mr. Jones prior to entering the classroom and whether this affected his teaching style. He admitted that he had patterned his lessons using much of what he learned in that course. The research for further study on engagement in the classroom should explore the effects on student learning of teachers who embraced the tenets of brain-based theory.

The study also had implications for professional development for teachers at all grade levels and in all subjects. This mathematics teacher used strategies that promoted autonomy in his students. The professional development should support the use of extensive and strong student encouragement, real-life problem solving modeled to student interest, and a safety in the routine of a classroom that celebrates successes and admits mistakes as part of the learning process.

REFERENCES

Ackerman, E. (1996). Perspective taking and object construction: two keys to learning. In Y. Kafai & M. Resnick (Eds.), *Constructionism in practice: designing, thinking, and learning in a digital world* (pp. 25-35). New Jersey. Lawrence Elrbaum Associates.

Allan, S.D. & Tomlinson, C.A. (2000). *Leadership for differentiating schools and classrooms.* Alexandria, VA: ASCD.

Altrichter, H., Feldman, A., Posch, P. & Somekh, B. (2008). *Teachers investigate their work; An introduction to action research across the professions.* Routledge. p. 147.

Ames, C. (1992). Classrooms: goals, structures and student motivation*. Journal* of *Educational Psychology*, 84(3), 261-271.

Ames, C. & Archer, J. (1988). Achievement goals in the classroom: students' learning strategies and motivation process. *Journal of Educational Psychology.*

Ames, C. (1995). Achievement goals, motivational climate, and motivational processes. In G.C.Roberts (Ed.), *Motivation in sport and exercise Human kinetics symposium on motivation and sport.* November 1989, 161-176, Champaign, IL: Human Kinetics Books.

Anderman, L. (1999). Classroom goal orientation, school belonging and social goals as predictors of students' positive and negative affect following the transition to middle school. *Journal of Research and Development in Education. 32*, 89-103.

Anderson, C.R., & Hoffmewaster, A.M. (2007). Knowing and teaching middle school mathematics: a professional development course for in-service teachers. *School Science and Mathematics,* 107(5), 193.

Anderson, L.W. (2004). *Increasing teacher effectiveness.* 2nd edition. Parwas: UNESCO International Institute for Educational Planning.

Anderson, Trevor (2007). Bridging the educational research-teaching practice gap. *Biochemistry and Molecular Biology Education,* 35(6), 471-477.

Anderson, L.W. & Pellicer, L.O. (1998). Toward an understanding of unusually successful programs for economically disadvantaged students. *Journal of Education for Students Placed at Risk,* 3(3), 237-263.

Bauersfeld, H. (1995). Language games. In P. Cobb & H. Bauersfeld (eds.), *The emergence of mathematical meaning: interactions in mathematics cultures,* 277-. Hillsdale: Lawrence Elrbaum.

Barrows, H.S. & Myers, A.C. (1993). Problem-based learning in secondary Schools. Unpublished monograph. Springfield, IL: Learning Institute, Lamphier High School and Southern Illinois University Medical School.

Bean, T. & Patel Patel Stevens, L. (2002). Scaffolding reflection for pre-service and in-service teachers. *Reflective Practice, 3*(2), 205-218.

Becker, J. and Varelas, M. Steffe, L. P. and Gale, J. (Eds) (1995) Assisting construction: the role of the teacher in assisting the learner's construction of pre-existing cultural knowledge. *Constructivism in Education.* Lawrence Erlbaum Associates: Hillsdale.

Belenky, M.F., Clinchy, B.M., Goldberger, N.R. & Tarule, J.M. (1986). *Women's ways of knowing.* NY: Basic Books.

Benware, C. & Deci, E. (1984). Quality of learning with an active versus passive motivational set. *American Research Journal,* 21(4), 755-765.

Biemiller, A., and D. Meichenbaum. (1992). The nature and nurture of the self-directed learner. *Educational Leadership*, 75, 75-80.

Bogdan, R. C., & Biklen, S. K. (1982). *Qualitative research for education: An introduction to theory and methods.* Boston: Allyn and Bacon, Inc.

Bogdan, R. C, & Biklen, S. K. (1998). *Qualitative research for education: An introduction to theory and methods.* Boston: Allyn and Bacon, Inc.

Boomer, G., Lester, N., Onore, C. & Cook, J. (Eds.) (1992). *Negotiating the curriculum: educating for the 21st century.* London: The Falmer Press.

Brophy, J. (2001). Introduction. In J. Brophy (Ed.), *Subject-specific instructional methods and activities.* Amsterdam: JAI. 1-23.

Brown, M. (1989) Graded assessment and learning hierarchies in mathematics-an alternative view. *British Educational Research Journal,* 15(2), 121-128.

Brown, A. & Walberg, H. (1993). Motivational effects on test scores of elementary students. *Journal of Educational Research,* 86(3): 133-136.

Bruner, J. (1986) *Actual minds, possible worlds.* Cambridge, MA: Harvard University Press.

Bruner, J. (1996) *The Culture of Education*, Cambridge, Mass.: Harvard University Press.

Creemers, B.P.M. (1999). The history, value, and purpose of school effectiveness studies. In D. Reynolds et al. (Eds). *Advances in school effectiveness research and practices. (9-23). Oxford: Pergamon.*

Cresswell, John W. (1998). *Qualitative inquiry and research design: choosing among five traditions*. Thousand Oaks, CA: Sage.

Chandler, C.L. & Connell, J. P. (1987). Children's intrinsic, extrinsic and internalized motivation: A developmental study of children's reasons for liked and disliked behaviors. *British Journal of Developmental Psychology, 5,* 357-365.

Christophel, Diane M. (1990). The relationships among teacher immediacy behaviors, student motivation, and learning. *Communication Education, 39.*

Council of Great City Schools. (1987). *Results in the making.* Washington, D.C.

Cook, Jon. (1992). Negotiating the curriculum: Programming for learning. In Garth Boomer, Nancy Lester, Cynthia Onore & Jon Cook (Eds). *Negotiating the curriculum: Educating for the 21st century.* London: The Falmer Press.15-31.

Cruickshank, D.R. (1990). *Research that informs teachers and teacher educators.* Bloomington, IN: Phi Delta Kappa Educational Foundation.

Csikszentmihalyi, M. (1995).Creative Insight: The social dimension of a solitary moment. MIT Press.

Darling-Hammond, L. (1998). Teacher learning that supports student learning. *Educational Leadership,* 55 (5), 6-11.

De La Fuente, J. (2004) Recent perspectives in the study of motivation: goal orientation theories. *Electronic Journal of Research in Educational Psychology.* 2(1), 35-62.

Deci, Edward L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology,* 18(1), 105-115.

Deci, Edward L. (1975). *Intrinsic motivation.* New York: Plenum.

Deci, Edward L., Nezlek, J., & Sheinman, J. (1981). Characteristics of the rewarder and intrinsic motivation of the rewardee. *Journal Of Personality and Social Psychology,* 40, 1-10.

Deci, Edward L. & Ryan, R.M. (1985). *Intrinsic motivation and self-determination in human behavior.* NY: Plenum.

Deci, E.L. & Ryan, R.M. (2000). The "what" and the "why" of goal pursuits: human needs and the self-determination of behavior. *Psychological Inquiry,* 11, 227-268.

Deci, E.L. & Ryan, R.M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology*, 49, 14-23.

Deci, E.L., Schwartz, A., Scheinman, L. & Ryan, R.M. (1981). An instrument to assess adult's orientations toward control versus autonomy in children: reflections on intrinsic motivation and perceived competence. *Journal of Educational Psychology,* 73, 642-650.

DiVesta, F. J. (1987). The cognitive movement and education. In J.A. Glover & R.R. Ronning (Eds.). *Historical Foundations of Educational Psychology.* New York: Plenum Press.

D'Andrade, R. (1981). The cultural part of cognition. Cogni*tive Science,* 5, 179-195.

Dowson, M. & McInerney, D.M. (2003). What do students say about their motivational goals? towards a more complex and dynamic perspective on student motivation. *Contemporary Educational Psychology,* 28, 91-113.

Dowson, M. & McInerney, D. M. (2001). Psychological parameters of students' social and work avoidance goals: a qualitative investigation. *Journal of Educational Psychology,* 93(1), 35-42.

Driver, R., Asoko, H., Leach, J., Mortimer, E. & Scott, P. (1994). 'Constructing scientific knowledge in the classroom'. *Educational Researcher,* 23(7), 5-12.

Duffy, T.M. & Jonassen, D. (1992). *Constructivism and the technology of instruction. A conversation.* Lawrence Erlbaum Association. Hillsdale, NJ: Hove and London.

Dweck, C.S. (1986). Motivational processes affecting learning. *American Psychologist,* 41(10), 1040-1048.

Dweck, C. S. (2000). *The handbook of competence and motivation.* New York: Guilford.

Eccles, J.S., Wigfield, A., Midgely, C., Reuman, D., MacIver, D., & Feldlaufer, H. (1993). Negative effects of traditional middle-schools on students' motivation. *Elementary School Journal,* 93, 553-574.

Eccles, J.S., Wigfield, A. & Schiefele, U. (1998). Motivation to succeed. In W. Damon (Series Ed.) and N. Eisenberg (Vol. Ed.), *Handbook of child psychology* (5th ed., Vol. III, pp. 1017-1095). New York: Wiley.

Elliot, A.J. & Dweck, C.S. (Eds.) (2005). *Handbook of competence and motivation.* New York: Guilford Press.

Elliot, A. J., McGregor, H.A. & Thrash, T. M. (2001). The need for competence. In E.L. Deci & R.M. Ryan (Eds.), *Handbook of self-determination Research. 361-387.* Rochester, NY: University of Rochester Press.

Elliott, Julian, Hufton, Neil, Hildreth, Anthony & Illushin, Leonid (1999). 'Factors influencing educational motivation: a study of attitudes, expectations and behavior of children in Sunderland, Kentucky and St. Petersburg'. *British Educational Research Journal,* 25(1), pp.75-94.

Faber, B. (1991). *Crisis in education: stress and burnout in the American teacher.* San Francisco: Jossey-Bass.

Fraenkel, J. & Wallen, N. (2009). *How to design and evaluate research in education* (7th Edition). Boston: McGraw Hill.

Gall, M.D., Borg, W.R. & Gall, J. P. (2003). *Educational research: An introduction* (7th Ed.). White Plains, NY: Longman.

Gardner, Howard. (1999). *Intelligence reframed: multiple intelligences for the 21st century.* New York: Basic Books.

Glaser, Barney G. & Strauss, Anselm L. (1967). *The discovery of grounded theory: strategies for qualitative research.* Chicago: Aldine.

Glesne, C. & Peshkin, A. (1992). *Becoming qualitative researchers: An introduction.* White Plains, NY: Longman.

Good, T.L. & Brophy, J.E. (1997). *Looking in classrooms (7th* ed.). New York: Harper Collins.

Goodenow, C. (1993). Classroom belonging among early adolescent students: relationships to motivation and achievement. *Journal of Early Adolescence,* 13, 21-43.

Green, J., Nelson, G., Martin, A., Marsh, H. (2006). The causal ordering of self-concept and academic motivation and its effect on academic achievement. *International Education Journal,* 7(4), 534-546.

Grolnick, W.S. & Ryan, R.M. (1987). Autonomy-support in education: creating The facilitating environment. In N. Hastings & J. Schwieso (Eds.), *New directions in educational psychology, Volume 2: Behavior and motivation.* London, England: Falmer Press.

Hardre, P.L. & Reeve, J. (2003). A motivational model of rural students' Intentions to persist in, versus drop out of high school. *Journal of Educational Psychology,* 95, 347-356.

Harackiewicz, J. M. (1979). The effects of reward contingency and performance feedback on intrinsic motivation. *Journal of Personality and Social Psychology,* 37, 1352-1363.

Harackiewicz, J. M. & Elliot, A. J. (1993). Achievement goals and intrinsic motivation. *Journal of Personality and Social Psychology,* 65, 904-915.

Hill, A. & Jones, H. (2005). Research in purpose and value for the study of technology in secondary schools: a theory of authentic learning. *International Journal of Technology and Design Education,* 15(1), 19-32.

Horst, S.J., Finney, S.J. & Barron, K.E. (2007). Moving beyond academic achievement measures: a study of social achievement goals. *Contemporary Educational Psychology,* 32, 667-698.

Howes, C. & Hamilton, C.E. (1992). Children's relationships with child care teachers: stability and concordance with parental attachments. *Child Development,* 63(4).

Howes, C., Jones, E. & Galinsky, E. (1995). *Florida quality improvement study: Interim report.* New York: Families and Work Institute.

Hoy, W.K., & Woolfolk, A.E. (1993). Teachers' sense of efficacy and the organizational health of schools. *The Elementary School Journal,* 93(4), 355-372.

Jensen, Eric (2008). A fresh look at brain based education. *Phi Delta Kappan,* February, 2008.

Jonassen, D.H. (1994) 'Thinking Technology: toward a constructivist design model', *Educational Technology*, April, pp. 34-37.

Juvonen, J., & Wentzel, K.R. (1996). *Social motivation understanding children's School adjustment.* Boston: Cambridge University Press.

Kemp, L., & Hall, A. H. (1992). *Impact of effective teaching research on student achievement and teacher performance: Equity and access implications quality education*. Jackson, MS: Jackson State University. (ERIC Document Reproduction Service No. ED 348 360).

Kilpatrick, Jeremy, Swafford, Jane, Findell, Bradford (Eds.) (2001). *Adding + it up helping children learn mathematics.* National Center For Research. Washington, DC: National Academy Press.

Kleinginna, Paul R., & Kleinginna, Anne M. (1981). A categorized list of Emotion definitions, with suggestions for a consensual definition. *Motivation and Emotion,* 5(4), 345-359.

Kontos, S., Howes, C., Shinn, M., Galinsky, E. (1995). *Quality in family child care and relative care.* New York: Teachers College Press, Columbia University.

Kukla-Acevedo, S. (2009). Do teacher characteristics matter? New results on the effects of teacher preparation on student achievement. *Economics Of Education Review,* 28(1), 49-57.

Learner, D., & Kruger, L. J. (1997). Attachment, self-concept, and academic motivation in high school students. American Journal of Orthopsychiatry, 67, 485-492.

Lester, N.B. & Onore, C.S. (1990). Learning Change: One school district meets language across the curriculum. Port Jones, NH: Boynton/Cook Publishers.

Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic inquiry.* Newbury Park, CA: Sage Publishing.

Lofland, John & Lofland, Lyn H. (1995). *Analyzing social settings,* (3rd ed.). Belmont, CA: Wadsworth.

Maehr, M.L. (1984). Meaning and motivation: toward a theory of personal investment. In R. Ames & C. Ames (Eds.). *Research on motivation in Education (Vol.1: Student Motivation, 115-144).* New York: Academic Press.

Maehr, M. & Meyer, H. (1997). Understanding motivation and schooling: where we've been, where we are, and where we need to go. *Educational Psychology Review,* 9, 371-409.

Maehr, M. & Midgley, C. (1996). *Transforming school cultures*. Boulder, CO: Westview.

Mayer, Richard (1999). Learning environments: the case for evidence based practice and issue-driven research. *Educational Psychology Review,* 15(4), 359-366.

McBer, Hay. (2000). *Research into teacher effectiveness.* Report prepared for the Department for Education and Employment. London.

McMahon, M. (1997). Social Constructivism and the World Wide Web- a Paradigm for learning. Perth, Australia.

Medley, D. M. (1982). Systemic observation. In H. E. Mitzel, J. H. Best, & W. Rabinowitz (Eds.), *Encyclopedia of educational research* (5th ed., Vol. 4, pp. 1841-1851). New York: Free Press.

Meece, J.L., Blumenfeld, P.C., Hoyle, R.H. (1988). Students' goal orientations and cognitive engagement in classroom activities. *Journal of Educational Psychology,* 80, 514-523.

Merriam, S.B. (1988). Case study in education: A qualitative approach. San Francisco, CA: Jossey-Bass.

Middleton, J.A. & Spanias, P.A. (1999). Motivation for achievement in mathematics: findings, generalizations, and criticisms of the research. *Journal for Research in Mathematics Education,* 30(1), 65-88.

Midgley, C. & Feldlaufer, H. (1989). Students' and teachers' decision-making fit before and after the transition to junior high school. *Journal of Early Adolescence,* 7, 225-241.

Miles, M. & Huberman, M. (1994). *Qualitative data analysis: An expanded sourcebook.* (2nd edition). Thousand Oaks, CA: Sage Publishing.

National Center for Educational Statistics (2001). U.S. Department of Education. Office of Educational Research and Improvement.

National Council of Teachers of Mathematics. (2000). Curriculum and evaluation standards for school mathematics. Reston, VA: Author.

National Council of Teachers of Mathematics. (2006). Curriculum and evaluation standards for school mathematics. Reston, VA: Author.

Nicholls, J. G. (1983). Conceptions of ability and achievement motivations: a theory and its implications for education. In S.G. Parwas, G.M. Olson, W. H. Stevenson (Eds.). *Learning and motivation in the classroom.* Hillsdale, NJ: Lawrence Erlbaum.

Nicholls, J. G., Cheung, P.C., Lauer, J. & Patashnick, M. (1989). Individual differences in academic motivation: perceived ability, goals, beliefs, and values. *Learning and Individual Differences,* 1, 63-84.

Noddings, N. (1997). Must we motivate? In N.C. Burbules & D.T. Hansen (Eds.) *Teaching and Its Predicaments. (pp. 24-43).* Boulder, CO: Westview Press.

North Carolina Standard Course of Study for Algebra I (2009). North Carolina Department of Public Instruction.

Osterman, K.F. (2000). Students' need for belonging in the school community. *Review of Educational Research*, 70,323-367.

Pajares, F., & Usher, E.L. (2008). Self-efficacy, motivation, and achievement in school from the perspective of reciprocal determinism. In M. Maehr, T. C. Urdan, & S. Karabenick (Eds.). *Advances in motivation and achievement. Vol. 15: Social Psychological perspectives (391-423).* Bingley, United Kingdom: Emerald Group Publishing Limited.

Patrick.,H., Anderman, L.H., & Ryan, A.M . (2002). Students' need for belonging In the school community. *Review of Educational Research.* 70(3), 323-367.

Patton, M. (2002). *Qualitative research and evaluation methods (*3rd ed). Thousand Oaks, CA: Sage Publications.

Perkins, D.N. & Salomon, G. (1989). Are cognitive skills context bound? *Educational Researcher,* 18(1): 16-25.

Phillips, D. (2000). *The expanded social scientist's bestiary: a guide to fabled threats to, and defenses of, naturalistic social sciences.* Lanham, MD: Rowman & Littlefield.

Pintrich, P. R. (2000). An achievement goal theory perspective on issues in motivation terminology, theory and research. *Contemporary Educational Psychology,* 25, 92-104.

Pintrich, P.R. & deGroot, E.V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology,* 82(1), 33-40.

Pintrich, P.R. & Schunk, D. H. (1996). *Motivation in Education.* Englewood Cliffs, NJ:

Pintrich, P.R. & Schunk, D.H. (2002). In K.M. Davis (Ed.), *Motivational in Education, theory, research, and applications.* (2nd ed.). Upper Saddle River, New Jersey: Pearson Education, Inc.

Porter, A.C. & Brophy, J. (1988). A synthesis of research on good teaching: insights from the work of the Institute for Research on Teaching. *Educational Leadership,* 45(8), 74-85.

Pugalee, David K. (2004). A comparison of verbal and written description of students' problem solving. *Educational Processes Studies in Mathematics,* 55, 27-47.

Rhodes, L.K. & Bellamy, G.T. (1999). Choices and consequences in the renewal of teacher education. *Journal of Teacher Education,* 50(1), 17.

Richardson, V. (2003). The Ph.D. in education. Retrieved July 4, 2007, from http://www.carnegiefoundation.org/CID/essays/CID_educ_Richardson.pdf

Rogoff, B. (1990). *Apprenticeship in thinking: cognitive development in social context*. NY: Oxford University Press.

Rousseau, Celia K. & Tate, William F. (2003). No time like the present: reflecting on equity in school mathematics. *Theory Into Practice,* 42(3), 210-216.

Ryan, A. M. (1982). Control and information in the intrapersonal sphere: an extension of cognitive evaluation theory. *Journal of Personality and Social Psychology,* 43, 450-461.

Ryan, A. M. & Connell, J.P. (1989). Perceived locus of causality and internalization: examining reasons for acting in two domains. *Journal Of Personality and Social Psychology,* 57, 749-761.

Ryan, A. M., Gheen, M.H. & Midgley, C. (1998). Why do some students avoid asking for help? An examination of the interplay among students' academic efficacy, teachers' social-emotional role, and the classroom goal structure. *Journal of Educational Psychology,* 90(3), 152-164.

Ryan, A. M. & Grolnick, W.S. (1986). Origins and pawns in the classroom: self-report and projective assessments of individual differences in children's perceptions. *Journal of Personality and Social Psychology,* 50, 550-558.

Ryan, A. M., Kiefer, S., & Hopkins, N.B. (2004). Young adolescents' social motivation: an achievement goal perspective. In P.R. Pintrich & M.L. Maehr (Eds.), *Motivating students, improving schools: the legacy of Carol Midgley. Advances in motivation and achievement (Vol.13).* Oxford: Elsevier.

Ryan, A.M., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal,* 38: 437-460.

Sandelowski, M. (1995). Focus on qualitative methods: sample sizes in qualitative research. *Research in Nursing and Health,* 18, 179-183.

Sanders, W. & Rivers, J. (1996). Cumulative and residual effects of teachers on future student academic achievement. In University of Tennessee value-Added Assessment Center, Knoxville, TN. Retrieved June 21, 2008 from http://mdk12.org/practices/ensure/tva/tva_2.

Savin-Baden, M. (2000). Problem-based learning in higher education: untold stories. *Higher Education.* 42(1).

Scheerens, J. (2003). Conceptual framework for the World Education Indicator survey on schools and teachers. Paper for the Organization for Economic Cooperation and Development.

Schiefele, U. & Csikszentmihalyi, M. (1995). Motivation and ability as factors in mathematics experience and achievement. *Journal for Research in Mathematics Education.* 26(2), 163-181.

Schunk, D. (1991). Self-efficacy and academic motivation. *Educational Psychology,* 26, 207-231.

Schunk, D., Pintrich, P. & Meece, J. (2008). *Motivation in educational theory, research, and applications.* Lawrence Erlbaum Associates, Hillsdale, NJ: Hove and London.

Seligman, M.E.P. (1975). *Helplessness: on depression, development and death.* San Francisco, CA: Freeman.

Slavin, R.E., Madden, N.A., Dolan, L.J., Wasik, B.A., Ross, S.M., Jones, L.J. (1995). Whenever and wherever we choose: the replication of success for all. *Phi Delta Kappa,* 75(8), 639-647.

Steinberg, L. (1996). *Beyond the classroom*. New York: Simon & Schuster.

Strauss, A. & Corbin, J. (1994). *Basics of qualitative research: grounded theory procedures and techniques.* Newbury Park, CA: Sage Publications, Inc.

TIMMS 2007 Results. IES National Center for Education Statistics. (2008). U.S. Department of Education Institute of Education Sciences. Retrieved December 2008 from http://nces.ed.gov/timms/results07.asp

Trochim, W.M.K. (2006). Evaluation research. *Research Methods Knowledge Base.* Retrieved June 10, 2008 from http://www.socialresearchmethods.net/kb/evaluation.htm

Urdan, T. & Maehr, M.L. (1995). Beyond a two-goal theory of motivation: a case for social goals. *Review of Educational Research,* 65, 213-244.

Urdan, T.C., Midgley, C., & Anderman, E.M. (1998). The role of classroom goal structure in students' use of self-handicapping strategies. *American Educational Research Journal,* 35(1), 101-122.

U.S. Census Bureau (2009). Fast Facts from the U.S. Census. Retrieved from www.Factfinder2.census.gov

U. S. Department of Education (2008) 'A nation accountable: twenty-five years after a nation at risk'. Retrieved on September 12, 2010 from www2.ed.gov/rschstat/research/pubs/accountable/accountable

Vandervoort, L. Amrein-Beardsley, A., & Berliner, D. (2004). National board certified teachers and their student's achievement. *Education Policy Analysis Archives,* 12(46).

Von Glaserfeld (1989). Abstraction, representation, and reflection. In L. P. Steffe (Ed.). *Epistemological foundations of mathematical experience.* NY: Springer.

Vygotsky, L. (1990). Retrieved May 2010 from: http://education.indiana.edu/cep/courses/p540/vygosc.htm

Vygotsky, L. (1974). The problem of age-periodization of child development. *Human Development,* 17, 24-40.

Wang, Chuang. (2003). Self-efficacy beliefs and self-regulated learning strategies of children learning English as a second language. Unpublished Doctoral dissertation. Ohio State University.

Wentzel, K. (1997). Student motivation in middle school: the role of perceived pedagogical caring. *Journal of Educational Psychology,* 89(3), 411-419.

Wentzel, K.R. (1999). Commentary: social influences on school adjustment. *Educational Psychologist,* 34, 59-70.

Whitebrook, M., Howes, C. & Phillips, D. (1989). *Who cares? Child care Teachers and the quality of care in America.* Final report National Child Care Staffing Study. Oakland: Child Care Employee Project.

White, R.W. (1963). Motivation reconsidered: the concept of competence. *Psychological Review,* 66, 297-333.

Williams, R.L. & Stockdale, S.L. (2004). Classroom motivation strategies for prospective teachers. *The Teacher Educator,* 39(3), 212-230.

Wood, D., Bruner, J. & Ross, G. (1976). The role of tutoring in problem solving, *Journal of Child Psychology and Psychiatry,* Vol. 17, 89-100.

Wood, T., Cobb, P., & Yackel, E. (1995). Reflections on learning and teaching Mathematics in elementary school. In L. Steffe & J. Gale (Eds.) *Constructivism in education.* New Jersey: Lawrence Erlbaum.

Yin, R. (1994). *Case study research: Design and methods* (2nd ed.). Thousand Oaks, CA: Sage Publishing.

Yin, R. (2003). *Case study research: Design and methods*. Thousand Oaks, CA: Sage Publishing.

APPENDIX A

SUMMARY OF IDENTIFIABLE PATTERNS FROM FIELD NOTES

1. Routine greeting at door every class period
2. Words spoken at door to each student
3. Routine established for students to begin work upon entering room.
4. Minimal chat upon entering room.
5. Bell rings and teacher closes door.
6. Teacher begins lesson within 30 seconds of bell ringing.
7. No roll call or checking roll.
8. Teacher says, “I’m going to do easy problem, so you can do the hard one.
9. Students respond to teacher as he works.
10. All students look at teacher as he works initial problem.
11. Teacher engages all students.
12. When teacher models problem he thinks aloud.
13. Students respond to teacher as he thinks-aloud.
14. Students begin to think-aloud.
15. When students are correct, teacher shouts and throws fist into air.
16. Students also shout and throw up their fists.
17. Students and teacher seem excited, pleased, and are smiling.
18. Teacher makes mistake and stops to rethink.
19. Teacher discusses how he is thinking about problem to correct the mistake.
20. Students begin to help get teacher back on track.

21. Teacher says that mistakes are part of learning.
22. Teacher says that without mistakes nothing happens.
23. Teacher reminds students how many times it took Edison to invent the light bulb. He was wrong, wrong, wrong but then the light came on!
24. Teacher uses humor when addressing students.
25. Teacher begins to use student career interests in problem-solving.
26. Problems move beyond Algebra I standard course of study.
27. The real-life solutions involve more than the Algebra I curriculum.
28. The teacher mentions that he is taking them into the higher level of mathematics to solve their career problem.
29. The teacher does not use the text.
30. The students solve individualized problems in their seatwork.
31. The problems pertain to their own career interests.
32. The teacher asks if students have homework questions.
33. The teacher answers the individual homework questions specifically to the individual student and not to the whole class.
34. The homework problems are all different.
35. The teacher never sits down.
36. The teacher moves from student to student during Smart Board and seatwork. Some are at Smart Board and some are in their seats.
37. Teacher picks up the homework sheets individually as he picks up the work he examines that work.

38. A student asks about his homework while other students are working on problems. The teacher quickly and quietly addresses that student's questions.
39. The bell rings and the teacher moves to the door and opens it.
40. The students quietly pack up.
41. As students move to the door, the teacher speaks to each of the students.
42. The students move quietly from the room.
43. The teacher appears to be thanking the students for their work. (Ask about this)
44. The teacher stands at the door every day before class and welcomes each student and gives a personal encouragement.
45. The bell rings and the door closes and the lesson begins immediately.
46. The students "assist" with the easy problem so they can do the hard one.
47. Students are assigned 5 students at a time to the Smart Board.
48. Each student has a different problem. No problems are from a book.
49. The teacher walks the room. He does not sit down.
50. He speaks individually with each seated student while also observing the problem solving at the Smart Board.
51. Every student has a turn at the Smart Board.
52. Every student has a different problem to solve.
53. Homework is addressed individually.
54. When students "get it" everyone celebrates.
55. Fist in air and shouts, "YES!"

56. Emotionally charged classroom. I want to shout!
57. Students have dialogue with teacher.
58. Problem solving is key here. Correct answer not as important as progress toward the correct answer and why it is so.
59. Teacher has a rubber face that expresses so many things!
60. He has a look that praises. A look that shows disappointment. A look that waits patiently for the answer. A look of surprise. A look of joy and delight.
61. The teacher believes in these students and models that belief.
62. Gestures of yes come on. You're almost there.
63. Gestures of ok, but, give me more. No words, just gestures with his hands and shoulders too.
64. A tilt of his head that gives one student a clue—like a bird that is alert to a sound. The student stops and starts again. The head jerks forward on the teacher and the student smiles and continues. Suddenly, the fist is thrown into the air and the teacher shouts, "YES!"

    The room erupts into "YES!" and nineteen additional fists are thrown.
65. Back to work as he turns back to the Smart Board and says, "Now, what about this?"
66. Students quietly think about his question. Different students offer opinions. One student goes down the wrong path, but he allows this. A twist of his lips and he thinks aloud. Why did you go there? Were you thinking….
67. He never says wrong or right. He celebrates with "Yes!" when they do really get it.

68. Eighteen weeks of the same routine with similar actions and reactions.
69. The climate in the room is either serene or charged!
70. Eighteen weeks in the room with the same door routine, but the students smile at him.
71. Eighteen weeks in this room with the same exit routine and cheerful students.
72. The students are reluctant to leave him. They pack unhurriedly and linger at the door as he thanks them.
73. There is serenity within the classroom. There is also a charged feeling of success.
74. There is serious intent. There is humor. Mistakes are part of learning.

APPENDIX B: FIELD NOTES OF A TYPICAL DAY

Class Bell Rings at 8:45 AM

8:40 AM: Mr. Jones is standing in the doorway to his classroom as students rush by in the hallway. A student comes to his door, stops, and Mr. Jones speaks to him. Student enters, opens notebook and begins copying something from a board on his far left. Eighteen more times this occurs. The student comes to door, stops, after a brief statement from Mr. Jones the student enters and begins copying.

8:45 AM: The bell rings, Mr. Jones closes door. He walks to Smart Board and declares. I'm going to do the easy problem so you can do the hard one.

8:50 AM : The students have assisted Mr. Jones in his problem-solving. He states questions to himself and the students respond. All students are absorbed in the problem on the Smart Board. Mr. Jones asks, What do I already know?" "Where do I want this thinking to take me?" and "What should I do first?" Suddenly Mr. Jones shouts, "Yes!" and throws a fist into the air. The students also shout "Yes!" and throw their fists into the air. He asks, "Did I get the solution?" The students response, "Yes!" and throw their fists into the air.

8:55 AM: Mr. Jones asks if we are ready to solve the hard one. Could we use the same thinking that we did in the last problem? The response is

that we could. There is some question in some voices. Mr. Jones says let's see. He says, OK what do I already know?

The students respond. He asks, How do I know that? The students respond. OK Where do I want this to take me? The students don't respond. OK What should I do first? The students respond and he performs the operation. Why, he asks did I do that? One student responds. Why? He asks again. Four students respond one after the other. Ok he moves on. How am I doing, he asks. The students hesitate and then spot a mistake. OK, mistakes are part of learning. So, should I continue on or to take a different track? The students want him to change tactics. Ok. How am I doing now? Am I on the right track? The students agree. But why he asks? Why this way? Will I get to the solution?

The students do not agree. A dialogue occurs.

9:00 AM: The students are discussing the problem with the teacher. The solution isn't as important as the dialogue concerning the correct procedure. The correct procedure will lead to the solution, but the importance is in arriving at the correct procedure to follow. One student suggests we try a certain computation. Mr. Jones writes it. The students become animated. Mr. Jones shouts, "Yes!" and the students shout, "Yes!" and fists are in the air.

9:10 AM: Five students take their places at the Smart Board with different problems on the board. The seated 14 students are given individual problems. Mr. Jones walks to each seated student and engages in

conversation. Students are nodding heads as he addresses their individual problem.

9:20 AM: The students at the Smart Board have completed the individual problems and each student involves the class of students in discussion of their problem. How did I start? Why? Am I on the right track? Did I get the solution? Why? And all the students are engaged. The students shout, “Yes!” for the first student at the Smart Board. The students shout, “Yes!” for the second student at the Smart Board.

The students shout, “Yes!” for the third, fourth, and fifth students.

9:25 AM: The next 5 students are at the Smart Board. There are 14 students seated. Mr. Jones walks and talks individually to the seated students. The new students are working individual problems on the Smart Board.

9:35 AM: The students have completed their individual problems and each student involves the class of students in discussion of their problem. How did I start? Why? Did I get the solution? No. Why? Student 2 doesn’t get the solution so the dialogue begins. The students work to the solution with a new track of reasoning. As the students develop the solution the “Yes!” and the fists are in the air.

9:40: The next five students go to the Smart Board while the 14 seated students are addressed individually as they work on their problems. Again Mr. Jones dialogues with the students individually.

9:50 AM: The five students at the Smart Board begin their explanations with questions to the group. What did I do first? Why? Should I have continued with this or moved to a different track? How did I do? Did I get the solution? Why?

9:55 AM: The last 4 students go to the Smart Board while the 14 seated students are addressed individually as they work different problems. Again Mr. Jones dialogues with each student. Also, it appears that students are handing in homework.

10:05 AM: The last 4 students have completed their individual problems at the Smart Board and begin the dialogue. The seated students are still engaged in the process. How did I do? Did I get the solution? I didn't get the solution laments student #2 at the board. Why? Where did I get off track? Several students suggest a different approach. Every student is engaged in the process. As the new approach works, the students shout, "YES!" and throw their fists with Mr. Jones joining in.

10:10 AM: The last four students hand in their homework to Mr. Jones. He speaks to the entire class concerning his plan for tomorrow. He sounds enthusiastic and the students are smiling. He implores them to give their best today.

10:15 AM: The bell rings. Mr. Jones opens the door. He speaks to each individual student as they leave his room. I hear "thank you for being attentive." He says, "You really worked today!" Great job!

(Note: Mr. Smith did not eat or drink or sit during the entire 90 minutes. He did not ever use a negative or look discouraged. His demeanor was positive. His dialogue with the students was one of problem-solving with a purpose.)

APPENDIX C: QUESTIONS FOR STUDENT OPEN-ENDED INTERVIEWS

1. How was Mr. Jones different from other classroom teachers you have had in the past? This open-ended question was intended to get a feeling for how the student viewed Mr. Jones as both a teacher and a person.
2. What did you learn in Mr. Jones's class? The intent of this question was to capture how the student viewed Mr. Jones as a communicator. There was also the expectation that the student would convey some sense of not only what he/she learned in the class but some of the experience behind that learning.
3. What did Mr. Jones do today? The question was posed to tap into some of the teacher's strategies or actions in the classroom as experienced by the student.
4. What would you say about Mr. Jones's class? This question was open-ended to allow the student to report feelings, facts, and even some discussion regarding the classroom environment.
5. Do you believe that you are learning in the class? How? Why? This question was intended to draw out the student's response to a question that may be answered with a simple yes or no. This question asked the student to think through the classroom dynamic and determine how his/her learning occurred.
6. Do you do your homework for the class? How often? Why? The homework issue was asked to determine motivation toward doing work outside the classroom.

APPENDIX D: INTERVIEW QUESTIONS FOR MR. JONES

(1) What do you believe generates the most interest in your lesson? This question was posed to note what the teacher believed he saw in the students' reactions to his lessons.

(2) How do you reward or punish students? This question was intended to determine if Mr. Jones used intrinsic or extrinsic motivators.

(3) How do you convey displeasure with the students? Let's say they won't try? This question was asked to determine relationships with those students who offered resistance in the classroom.

(4) Discuss your strategies in the classroom. This was a discussion question that left open the opportunity for Mr. Jones to clarify his teaching strategies.

(5) Do you give and grade homework? This was an exploratory question asked to determine his beliefs in reinforcement of classroom instruction.

(6) How would you describe the climate in your classroom? This was another exploratory question asked to determine how Mr. Jones viewed his own establishment of classroom learning environment.

(7) What can you tell me about yourself and your interests? Another question posed to learn more about Mr. Jones.

(8) What motivates you to do your job? This question was asked to determine Mr. Jones' own motivational mindset.

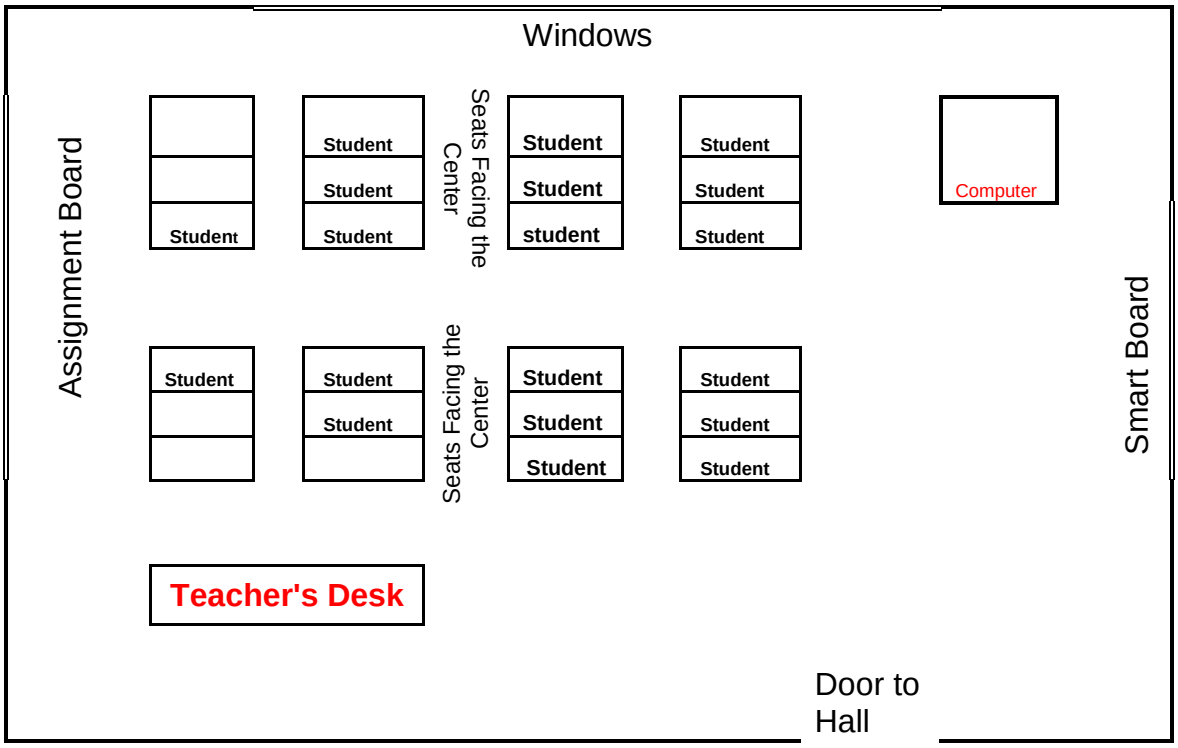
APPENDIX E: FOLLOW-UP QUESTIONS ASKED TO STUDENTS

EACH QUESTION WAS ADDRESSED TO A DIFFERENT STUDENT

1. I thought your answer was interesting about Mr. Smith being different than any teacher you've ever had. Why do you say that? How is he different?
2. You mentioned that Mr. Jones is a "trip" when I asked you a question the other day about him. What do you mean?
3. When I asked about homework you laughed about it. Why?
4. I am still confused about your answer about how Mr. Jones is different. Would you explain your answer?
5. When I asked about what Mr. Jones did in class today I didn't understand your answer. Would you explain it?
6. Yesterday when I asked you about what you are learning, I was puzzled by your answer. What did you mean?
7. I wondered if you could tell me more about Mr. Jones's class?
8. You told me that homework was a joke. What did you mean?
9. I needed to know what you meant when you told me you couldn't say anything about Mr. Jones's class? Why?
10. You sounded like you didn't want to answer the question about homework. Why?
11. The other day when we talked, I asked you if you are learning in Mr. Jones's class. I didn't understand your answer. You said you were learning more than your sister. Is your sister in the class?

12. I enjoyed our interview the other day, but I needed to hear your answer about what you learned that day in Mr. Jones's class. You told me about what Mr. Jones was teaching, but what did you learn that day?
13. I couldn't understand what you said about Mr. Jones's class when I asked you the other day. My question was: What would you say about Mr. Jones's class?
14. Thank you for seeing me again. I had just one more question for you. What are you learning in Mr. Jones's class?

APPENDIX F: THE CLASSROOM LAYOUT OF MR. JONES



Appendix F: The classroom Layout of Mr. Jones

This drawing indicated the layout of the classroom. The student desks were in four columns with three student desks deep. The student rows closest to the door had students facing the center of the classroom. The student rows closest to the windows had the students facing the center of the classroom. Mr. Jones walked the rows and columns.