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The influence of a transformative elementary science curriculum on at-risk students: A case report

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on at-risk students: A case report**

Grimes, M. Katheryn, M.S.

University of Nevada, Las Vegas, 1994

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The Influence of a Transformative Elementary Science
Curriculum on At-Risk Students: A Case Report

by

M. Katheryn Grimes

A thesis submitted in partial fulfillment
of the requirements for the degree of

Master of Science

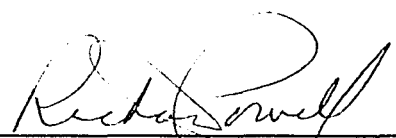
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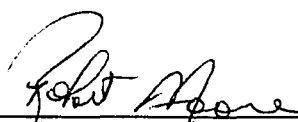
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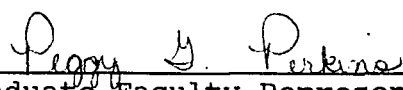
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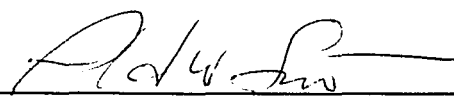
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ABSTRACT

This study explored the influence of a transformative elementary science curriculum on at-risk students. Project S.M.I.L.E., the focus of this study, uses strategies for curriculum development proposed by theorists of the post-modern era within the framework of social constructivism. Students in this program collaborate in their roles as students-as-teachers to prepare and present lessons to visitors of their school's natural history museum and science laboratory.

Data collection was conducted at Alison Leigh Elementary School in a metropolitan area of the southwestern United States. Observations of the students, interviews with parents and classroom teachers, student discussions, and journal writings of the 17 fifth grade S.M.I.L.E. team students were collected for data analysis in this case study. Five themes emerged from the data that conceptualized the influence of a transformative elementary science curriculum on at-risk students. Implications for transformative curriculum development were drawn.

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ACKNOWLEDGEMENTS

I owe my gratitude to many individuals for their valuable assistance during this thesis study.

First, I wish to thank my family who have consistently given me love and encouragement for this project and have sacrificed many hours for my benefit. Thank you Alison, Kevin, Austin, Kyle, Patrick, Ryan, Shaunta, Jill, and Russel. I am especially grateful to my husband, Keith, whose knowledge, skills, and kindness aided me throughout the many drafts of this work.

Second, words cannot express my gratitude to Teddie Lynn Brewer, who opened doors for Project S.M.I.L.E. Without her administrative support, this transformative program would not have developed. She is truly a collegial learner with her teachers.

Additionally, I extend gratitude to my graduate committee for their expertise and precious time. My warm appreciation to Dr. Jane McCarthy, my chair, whose calm nature and sound advice kept me focused. I especially thank Dr. Richard R. Powell. The countless hours of sincere, scholarly guidance given me during this past year have been educationally and personally rewarding. I am truly blessed to have worked with him and to count him as my friend.

Finally, I thank the members of the S.M.I.L.E. teams, those wonderful students who have been directly responsible for my transformation. My love to them.

CHAPTER 1

We have allowed our schools to remain in the past, while our children have been born in the future. The result is a mismatch of learner and educator. But it is not the children who are mismatched to the schools; the schools are mismatched to the children. Only by revising educational practice in light of how our culture has changed can we close this gap and reunite our schools with our children and the rest of our society. (Strommen & Lincoln, 1992, p. 475)

Overview of the Study

Introduction

The history of Western thought can be categorized into three developments: the pre-modern, modern, and post-modern eras. Doll (1993) describes the pre-modern era existing from the ancient Greeks to Renaissance, the modern era lasting through the scientific and industrial revolutions, and the post-modern era surfacing in present day.

For purposes of this study, the educational transition from the modern to the post-modern era is of significant importance. The modern era is characterized by the scientific and industrial revolutions. Assembly lines, factories, and Newtonian science exemplify models for the educational setting during this modern era. Doll (1993) notes, "Those holding this vision believed that through industrialization a new society would be born--one utilizing the tenets of science for the economic and social benefit of all" (p. 39). This model became popular in the work force, home, schools, and even churches. Joseph Mayer Rice

furthered this modernistic paradigm for education as he saw "a management system, not teachers' own growth, as the way to educational reform" (Doll, 1993, p. 42).

Applying the industrial model to school curriculum, there was a natural order or best way in teaching that educators believed should be followed. The key to efficiency and standardization was for workers, including teachers, to follow prescribed instructional strategies and curricular materials (Cremin, 1961). Teachers carried this authoritative model into the classrooms for their students. Doll (1993) argues, however, that this model is inappropriate for students in a contemporary, post-modern society. He notes:

While it [modernism] has accomplished near miracles in the fields of medicine and microbiology, it has been quite ineffective in dealing with growth, development, and personal or physical interactions looked at from a systems network viewpoint. In short, modern thought has not provided a good model for the education of human beings. (p. 26)

The post-modern era has surfaced in part through the multiplicity of contemporary technologies. This era's beginning is not easily documented, in contrast to the beginning of the modern era. Doll (1993) cites Charles Jenks, art historian, in describing three features of the post-modern era: 1) it builds on the past while at the same time it transcends the past, meaning the present is entwined with yesterday and tomorrow; 2) it is eclectic in nature so that choices and combinations from the past and present are

the best for the job at hand; and 3) it has multilayers of interpretation, as it looks to the past in order to "code past remnants within a future vision" (Doll, 1993, p. 8) As all three features use the past in moving toward the future, one can see that "in this complex relationship, the future is not so much a break with, or antithesis to, the past [but rather] a transformation of it." (Doll, 1992, p. 8).

Aligning with the post-modern era's view of education is the transformative curriculum where the modern era's authority and control are challenged. The transformative curriculum proposes exchange of meaningful dialogue between teachers and students so they become collegial learners with one another, i.e. members of a team (Doll, 1993; Strommen & Lincoln, 1992; Gergen, 1991). Additionally, a transformative curriculum is based on the assumption that not only does curriculum change the learner, but the learner also affects and changes the curriculum (Bredekamp & Rosegrant, 1992).

The transition into the post-modern era has not been easy for society (Doll, 1993). Contemporary problems have surfaced in the classroom, one such problem being that of the at-risk child. Mizell (1986) describes at-risk children as those "most likely to have trouble coping with the academic and behavior expectations of the public schools" (p. 22). This situation has many causal conditions, including poverty, parental substance abuse, and family

instability (Harbin, 1991). Educational reforms are needed for these at-risk children, since the industrial model for classroom curriculum is reportedly limited in its capacity to meet their needs (Weinberg, 1971; Covington, 1984). One possible educational reform is the transformative curriculum (Doll, 1993).

Context of the Study

To explore how at-risk students interact with a transformative curriculum (Doll, 1993), this study focused on an elementary science curriculum in a large metropolitan school district in the desert Southwest. This program, Project S.M.I.L.E. (Science Museum and Instructional Laboratory for the Environment), uses fifth grade at-risk students as curators for the school's natural history museum and teachers in the science laboratory. The S.M.I.L.E. team, numbering 32 students, prepare and present tours and science lessons for visitors to the school. The team members are decision makers and teachers.

Purpose of this Study

The overall purpose of this study was to explore how a transformative elementary science education curriculum, specifically Project S.M.I.L.E., enhanced self-worth for at-risk students and fostered their interaction with science content. Mizell (1986) contends that many at-risk problems can be alleviated by a curriculum that strengthens a

student's self worth. Some educational programs currently exist which promote self-worth through peer tutoring, using students as teachers (Gray-Shoffner, 1986; Diamond, John, Cleary, & Librero 1987; Webb, 1987; Warger 1991). For example, the Student Study Center in Colorado identifies high school students at-risk of dropping out of school, places them in a special tutoring center for small group instruction, and encourages their development in the academics through activities designed to build self-worth and autonomy (Gray-Shoffner, 1986). As another example, the Exploratorium's Explainer Program (EEP) in San Francisco engages at-risk high school students as guides for a natural history museum. Education is subsequently not only a means of support for these students, but also the avenue for building their self-worth and autonomy (Diamond et al., 1987).

Like the EEP, this study of Project S.M.I.L.E. focused on the self-worth of at-risk elementary children in using a students-as-teachers leadership model within an elementary science curriculum. Assigning at-risk students these positions of leadership follows the transformational paradigm suggested by Doll (1993).

Research Questions

This study's purpose was to determine ways that a transformative elementary science curriculum influences at-risk children who are placed in positions of leadership in

school. Following this objective, this study, began by posing this question: In what ways does a transformative elementary science curriculum influence at-risk students? However, as data were collected and analyzed over a school year, I was able to develop a more extensive set of questions related to the purpose. Ultimately, the study asked,

- 1) To what extent does a transformative elementary science curriculum foster interaction with science content?
- 2) In what ways does a transformative elementary science curriculum foster self-worth in at-risk students?
- 3) What relationship exists between student self-worth and student autonomy?
- 4) What social interactions occur within a transformative elementary science curriculum, specifically Project S.M.I.L.E., that enhance self-worth?

Theoretical Framework

The framework for this study is social constructivism (Berger & Luckmann, 1967; Goodson, 1990; Nencel & Pels, 1991; Gergen, 1991). Goodson (1990) views curriculum as being socially constructed at the levels of prescription (the actual curriculum), process (the internalizing of the curriculum), and practice (the involvement of learner at the

preactive and the interactive levels). In addition to Goodson, Vygotsky, as reported by Au and Kawakami (1984), proposes that social constructivism is accomplished through examining the characteristics and patterning of interactions between children and teachers.

Social constructivism also provides an explanatory framework for the development of a post-modern transformative curriculum. Doll (1993) holds that a transformative curriculum causes students to become "active creators of knowledge rather than receivers of pre-ordained truths" (p. 8). This suggests that knowledge is socially constructed within the learner, not given to the learner.

Further works of Mehan (1975) and Bredekamp and Rosegrant (1992) emphasize the social constructs of knowledge or reality. It is within this post-modern, transformational framework that students construct a personal knowledge base for science (Doll, 1993).

For this study of Project S.M.I.L.E., as the students interacted with the science content they taught, I assumed that science learning occurred. However, the general focus of this study was not specifically on science learning but on factors which may have fostered learning.

Methodology

Studying the students as they perform their duties and as they naturally interact with other persons required methods that were commensurate with qualitative research.

These methods included interviews, observations, and participant observation. As the science resource teacher in this school, I acted as a participant observer (Jorgensen, 1989) in this case study.

To ensure triangulation, multiple sources of data were gathered (Mathison, 1988). Field observations and note collections (Sanjek, 1990) were made, audio-tape group "feed-back" sessions were recorded, and personal journals of the student participants were kept. I also maintained a reflective notebook throughout the study (Guba & Lincoln, 1982). Data collected using these methods were analyzed using the constant comparative method described by Strauss and Corbin (1990).

Contributions of the Study

The investigations of this study contribute to transformative curriculum literature in three ways. First, as Project S.M.I.L.E. is a model program for a transformative elementary science curriculum for at-risk students, this study provides insight as to the development of such a curriculum. Currently, studies are limited that describe a transformative curriculum in practice (Doll, 1993).

Second, Project S.M.I.L.E. lends itself to the post-modern era as the at-risk students assume the responsibilities of teachers in their planning and presentations. This study exemplifies the collegial learner

student/teacher relationship as opposed to the teacher in the role of authority. Since this post-modern era has surfaced relatively recently, literature is currently limited on programs that coincide with this paradigm (Doll, 1993).

Finally, this study of Project S.M.I.L.E. contributes to the knowledge of how a transformative curriculum fosters the development of self-worth with at-risk students through social interactions. Currently, quantitative studies exist within the programs of peer tutoring (Osguthorpe & Scruggs, 1986). However, literature has failed to report substantial qualitative research in this area (Osguthorpe & Scruggs, 1986). Furthermore, this study of Project S.M.I.L.E. takes peer tutoring into a new dimension, to the level of students-as-teachers. Existing literature is weak in the area of the students-as-teachers concept, especially with respect to the at-risk students leadership roles in such a program.

CHAPTER 2

Review of the Literature

There are four specific goals of this chapter. First, this chapter examines the literature related to the transition from the modern era to the post-modern era and discusses the importance of this transition to education. A second goal is to explore the meaning of a transformative curriculum. Programs and studies reflective of a transformative curriculum are reviewed. Third, this chapter examines literature relevant to the problems of the at-risk student and reviews studies addressing these problems. Finally, literature is explored which relates social constructivism to the study of Project S.M.I.L.E.

Introduction

One can hardly believe there has been a revolution in all history so rapid, so extensive, so complete . . . [it] overshadows and even controls all others . . . [it is] writ so large that he who runs may read. (Dewey, 1915/1956, School and Society, p. 8.)

Industrialization, the topic of this statement by Dewey, is the "concrete embodiment of the modern vision" (Doll 1993, p. 39). Doll explains that this modern, industrial era carried the United States from a lower level agricultural power to a leader in the world of industry.

There were also important implications of the industrial era for educational settings. Theorists, such as Comte de Saint-Simon, expounded authoritarian socialism with

the belief that society had to be led by those with expertise (Doll 1993). Certainly, this authoritarian model, developed from the modernist era, can be traced throughout the last century of education.

According to Doll (1993), control is the important characteristic of the modernist's reign. It is this same characteristic that disallows modernism to relinquish its hold in education. As Doll (1993) notes:

Modernism, especially in its educational and curricular manifestations, has feared loosening the tautness of the string of control. Post-modernism helps us see that nature itself consists of flexible order, that order and chaos are not diametrically and irrevocably opposed but are embedded one within the other. (p. 29)

As modernism is replaced with what is now viewed by some theorists a post-modern society, our educational institutions are finding themselves in the midst of transition. Literature suggests that if educators are to move from the authoritarian, modernistic viewpoint of science instruction to one that is more transformative, then alternative educational settings should be considered. One possible setting is that described by Doll (1993) as the post-modern, transformative curriculum. This transformative curriculum development is on "the cusp of change, providing a powerful vision of what might be" (Soltis, 1993, xi).

One program described by McCracken (1987) uses the post-modern approach with a program at Union County College in Cranford, New Jersey. In this report, McCracken (1987) describes the differences between the modernistic and post-

modernistic curriculum development. Although McCracken (1987) noted the need for curriculum reform due to the cultural change of modernism to post-modernism, the initiated program was for honor students. Subsequently, not all students were able to benefit from the post-modern curriculum that was developed.

Transformative Curriculum

This section discusses the emergence of the transformative curriculum as a function of post-modern theory. Doll's (1993) open system of discourse using the self-organizing process within the four R's of the transformative curriculum will be explained in relationship to Project S.M.I.L.E., the object of this study.

Bredekamp and Rosegrant (1992) define transformative curriculum as that which is based on the assumption that not only does curriculum change the learner, but the learner also affects and changes the curriculum. Furthermore, this transformational curriculum is needed "to help all children reach their potentials as developing human beings and learners. Such a curriculum is meaningful; intellectual; and developmentally, culturally, and individually appropriate" (Bredekamp & Rosegrant, 1992, p. 102).

The teacher as facilitator of educational discourse rather than the teacher as authority of knowledge is appropriate for this transformative curriculum paradigm (Doll, 1993; Strommen & Lincoln, 1992).

The transformative curriculum aligns with the principles of the post-modern views of education. Germane to the study at hand, Gergen (1991) asserts that education in this post-modern era should be a dialogue of students as experts within their own academic fields engaged in alternative activities, such that an exchange of discourse is beneficial to each student. "Teachers would invite students into modes of dialogue as participants rather than pawns, as collaborative interlocutors instead of slates to be filled" (p. 250).

Doll (1993) refers to this exchange as an open system where education is allowed to be transformed as opposed to the closed, modern system where knowledge is transmitted. To exemplify this, Doll (1993) recalls the explanation of Einstein's physics. As $E = mc^2$ demonstrates an exchange of both energy and matter, these two quantities can be transformed one into the other. Doll contends this open, transformational system is needed in the development of curriculum, where knowledge is exchanged from the teacher to student and student to teacher. He argues that teaching should be "aiding, helping, stimulating, and challenging the natural, self-organizing processes" (p. 63).

The question of how this transformation takes place is now central to educational curriculum development in public schools. "Process--particularly self-organizing process--is the essential ingredient in a post-modern, transformative

pedagogy" (Doll, 1993, p. 149). This process is crucial in making connections with curriculum and the real world in a hermeneutic frame. Gadamer, as cited by Doll (1993), contends that these connections (e.g. meanings) are based on discourse with others. However, our teacher pre-service programs do little to instruct teachers in the art of engaging students in dialogue (Doll, 1993; Strommen & Lincoln, 1992). Questions asked to students need to go beyond the factual into the interpretive. As Doll (1993) notes:

Passages are negotiated. . . between text and reader, between teacher and pupil, between experience and consciousness. Negotiating these passages--instead of laying out the truth of a proposition, term, or viewpoint--seems to me what curriculum is or should be. In "negotiating passages" each party listens actively. . . . to what the other is saying. The intent is not to prove (even to oneself) the correctness of a position but to find ways to connect varying viewpoints, to expand one's horizon through active engagement with another. This engagement is a process activity, which transforms both parties, be they text and reader or student and teacher. (p. 151).

This post-modern, transformative movement in curriculum has roots with some of the most respected theorists in education. Doll (1993) cites the open or thought process theories of Jerome Bruner, John Dewey, Jean Piaget, and Alfred North Whitehead as being crucial to this transformational development. The struggles of these theorists against the closed, modernist systems advocate the transformation to the open, post-modern curriculum movement (Doll, 1993).

Each of these theorists, in their own way, proposed self-organization to be important in curriculum development. A quality of self-organization is disruptiveness, essential to this transformative paradigm. As Doll (1993) notes:

In systemic terms, open systems require disruptions in order to function, closed systems abhor disruptions--they threaten the very functioning of the system. Analogously, assuming a self-organizing, open system framework, teachers need student challenges in order to perform their role in the interactive process. In a nonself-organizing, closed system framework, student challenges threaten that role and the teacher's functioning. The question of teacher attitudes, then, . . . is crucial. (p. 159)

The teacher as a member of a team, providing technical assistance and creative consultation rather than direction in tasks, is the transformative model of education proposed by Strommen and Lincoln (1992) in their report of a New York program that incorporates the transformative model to the computer classes in the middle school. In this respect, the teacher is not seen as much as one in the traditional role, but rather as a teacher as a collegial learner. "The teacher also becomes a student as the children discover new procedures and instruct the teacher in their use" (Strommen & Lincoln, 1992, p. 472). Building on the work of Walzer, Giroux (1991) notes that the teacher must develop pedagogical practices "that not only heighten the possibilities for critical consciousness but also for transformative action" (p. 54).

Leaving the 3 R's of "Reading, 'Riting, and 'Rithmetic which are central components to traditional curricula in

education, Doll (1993) suggests the 4 R's of a transformative curriculum--a curriculum that should be Rich, Recursive, Relational, and Rigorous. Richness refers to the depth of a curriculum, to its layers of meaning. "In order for students and teachers to transform and be transformed, a curriculum needs to have the 'right amount' of indeterminacy, anomaly, inefficiency, chaos, disequilibrium, dissipation, and lived experience" (p. 176).

Second, a recursive curriculum is one which encourages thinking to be looped back on itself. "Such looping, thoughts on thoughts, distinguishes human consciousness; it is the way we make meaning" (p. 177). Doll (1993) cites Bruner, Piaget, Dewey, and Whitehead as advocates in this area. "Much of the process of education consists of being able to distance oneself in some way from what one knows by being able to reflect on one's own knowledge" (Bruner, 1986, p. 177). In this aspect of curriculum, there is no beginning or ending. "As Dewey has pointed out, every ending is a new beginning, every beginning emerges from a prior ending" (Doll, 1993, p. 178). Opportunities for reflection are the results of such a curriculum where each project is not complete but, rather, the beginning of another (Doll, 1993).

The third aspect of a transformative curriculum deals with the relations embodied within the pedagogy and the cultures of the educational matrix (Doll, 1993). This

matrix combines the pedagogy that is rich, being built on recursion, with the cultures outside of the curriculum itself. As these relations develop, Doll (1993) contends the textbook is something to revise, not to follow. "It is the base from which transformation occurs. Curriculum in a post-modern frame needs to be created (self-organized) by the classroom community, not by textbook authors" (p. 180).

Doll (1993) further notes:

As teachers we cannot, do not, transmit information directly; rather, we perform the teaching act when we help others negotiate passages between their constructs and ours, between ours and others'. This is why Dewey says teaching is an interactive process with learning a by-product of that interaction." (p. 180)

Doll's final "R", rigor, relates to the assessment of curriculum. Education, in the modernist era, depends on the objective and the observable, a world that can be measured and manipulated. Doll (1993) contends curriculum must "draw on qualities foreign to a modernist frame--interpretation and indeterminacy" (p. 182). With interpretation, rigor develops in the aspect of "negotiating passages" within assumptions of the curriculum. According to Doll (1993), this dialogue subsequently allows rigor to be meaningful and transformative. Continuing, Doll (1993) proposes indeterminacy depends on exploring for new interpretations, combinations, and patterns. ". . . one can never be certain one has it right--not even to the 95th or 99th percentile of probability. . . . Here rigor means purposely looking for different alternatives, relations, connections" (p. 182).

In summary, curriculum theorists such as Doll (1993) are arguing that the modernist era of education is being replaced by a post-modern era. Consequently, the transformative curriculum, where the student and teacher work as colleagues, is surfacing as one of the contemporary models for classroom instruction. Doll (1993) summarizes this transformative curriculum in his Pedagogic Creed as follows:

In a reflective relationship between teacher and student, the teacher does not ask the student to accept the teachers's authority; rather, the teacher asks the student to suspend disbelief in that authority, to join with the teacher in inquiry, into that which the student is experiencing. The teacher agrees to help the student understand the meaning of the advice given, to be readily confrontable by the student, and to work with the student in reflecting on the tacit understanding each has. (p. 160)

This transformative curriculum has significant importance to this study of Project S.M.I.L.E. The described reflective relationship between teacher and student, meaningful dialogue with students, and exchange of roles from student to that of teacher are all a part of the program. Furthermore, Project S.M.I.L.E. transforms the unusual into the prescribed by appointing the leadership of the program to at-risk students. Modernistic views might deem these at-risk students as being incapable of such a leadership role. In order to better understand at-risk students in the modernistic setting and their needs in the post-modernistic setting, the following section presents a

review of the existing literature on at-risk students in our society.

At-Risk Students

The goals of this section are to discuss various features of at-risk students as they are currently defined by contemporary educators, to review the history of at-risk students, and to examine the relationship between a transformative curriculum and at-risk students.

Throughout the history of education in the United States, education for all was not only accepted but expected (Jarolimek, 1981). However, this was hard to accomplish due to the importance of economic survival of the family, especially in farming communities.

Not until after World War II did secondary education become an expected norm. The schooling pattern in the United States developed into a uniform educational setting for all children. Jarolimek (1981) reports those post World War II educational standards as follows: "Now that nearly all children attended high school, the challenge facing educators and teachers was to design an educational program . . . that was in tune with the educational requirements of all of America's youth" (p. 14).

Recently, education for all has taken further steps in its goal with the acceptance of all children as educable, regardless of their mental or physical handicaps. Jarolimek (1981) notes that the influx of immigrants to the United

States, the expanded student population, the changing marketplace where technology has been substituted for workers, recent international relations, and new views of social power are all components of a different society that affects education.

With the changes society has faced during the past fifty years, education for all has become a true challenge (Jarolimek, 1981). For example, the number of children "at-risk" of dropping out of the school setting has risen dramatically in recent years (Mizell, 1986). Mizell (1986) notes:

National studies. . . have found that dropouts are more likely to be students from low-income families; those who are two or more years behind grade level; and those with behavior problems, low grades, and parents with low educational aspirations. (p. 21)

Furthermore, even though very few elementary students drop out of school, Mizell (1986) contends that educators many times can identify at this early age students "who are most likely to have trouble coping with the academic and behavior expectations of the public schools. . . . [which] often cause them to drop out of school later" (p. 22). Gray-Shoffner (1986) report that truancy, severe misbehavior, and experimentation with drugs, alcohol, and sex are characteristics of the at-risk student, now commonly found as early as the middle school environment.

Facing these societal problems and changes, educational reform must address the inherent needs of the at-risk

students. One way to address the particular needs of these students, as suggested by Mizell (1986), is to develop programs which strengthen students' self-worth or relationships with their peers.

Self-worth and at-risk children in low socio-economic conditions.

Of importance to this study of Project S.M.I.L.E. are the at-risk children exposed to the low socio-economic environment. This situation poses special problems for these children, all of which relate to their self-worth. As feelings about oneself develop as a result of successful experiences, many children from the lower-class do not have opportunities to build a repertoire of success (Jarolimek, 1983). "They live in poverty while others around them live in affluence" (p. 175). Furthermore, Jarolimek (1983) notes that not only are their experiences limited due to this poverty, but their parents are not significant decision makers in the community. "These children develop poor images of themselves" (p. 176).

According to Covington (1984), the main elements of self-worth are influenced by performance level, self-estimates of ability, and degree of effort expenditure. "Unless people can become successful at some valued activity, they will be cut off from a major source of self-[worth]" (p. 8). Weinberg (1971) contends this lack of

successful performance carries a connotation of inferiority.

He notes:

The children of poverty may very quickly assume, once they become sensitive to social differentiation, that there is some kind of relationship between economic inferiority and personal inferiority. Should this occur, the motivation for success becomes dissipated in a concept of the self that finds it hard to believe that one is capable of success. (p. 43)

Since children value themselves to the degree they are valued by others (Ames, Gillespie, & Streff, 1972), "negative self-attitudes can be changed to high self-[worth] by providing a child with a nurturing climate of acceptance and experiences of success" (p. 73).

Two programs in line with developing the climate of success have been reported as being successful in promoting the participating students' self-worth. The Student Study Center in Adams County Middle School, Colorado, identifies students at-risk of dropping out of school and places them in an in-school suspension program, where they are given personal attention by adult and student tutors (Gray-Shoffner, 1986). Progress in subject areas are noted and praised, giving the students a feeling of success and self accomplishment. Returning to the regular classroom usually brings with it a determination of the student to deal effectively with the expectations of that class (Gray-Shoffner, 1986).

A second program that works on developing the at-risk student's self-worth is The Exploratorium's Explainer

Program in San Francisco, California (Diamond et al., 1987). Students in this program, identified as being at-risk, are given the responsibilities of being tour guides for a local science museum. This program produced some interesting results. First, the students increased their science content knowledge through the development of their curiosity, interest, and confidence in learning science. Second, their ability to teach people, desire to work with people, desire to work on their own, and understanding of their capabilities were noted. However, as Diamond (1987) reports, the increased self worth was of significant importance to the students' skills and educational development. These programs use social interactions to build the self-worth of the at-risk students. The process by which social construction interacts with at-risk students is of significant importance to the transformative curriculum (Doll, 1993).

Several other research cases are available that describe students teaching other students in at-risk situations (Colorado Council for Learning Disabilities, 1992; Pino, 1990; Levine, 1986; Osguthorpe & Scruggs, 1986; Cohen, Kulik, & Kulik, 1982).

For example, Osguthorpe and Scruggs (1986) explored special education students as tutors. The student tutors were learning disabled, behaviorally disordered, or mentally retarded. The tutees in the studies were younger students

or students with disabilities of a more severe nature. Results indicated academic gains for both the tutors and tutees. However, these studies were conducted using quantitative methodology, evaluating the academic gains alone; hence, they were lacking on their evaluation of self-worth to the students (Osguthorpe & Scruggs, 1986).

Furthermore, these studies described the tutoring, or teaching, experiences of these children within the paradigm of the traditional educational setting. The tutors/teachers were given curriculum content to be taught with intense training prior to the tutoring lessons. Lacking in literature are studies that support the transformative model of education, especially for at-risk elementary children.

Project S.M.I.L.E. is a transformative science curriculum that uses at-risk elementary students from a low socio-economic environment as teachers in leadership positions. The students are not tutors of others, in the traditional sense. They are teachers of a science curriculum which they have researched, prepared, and rehearsed together. S.M.I.L.E. team members make decisions together and interact with each other for the development of the curriculum. In this sense, they socially construct the curriculum they will be teaching.

Social Constructivism

In order to explore at-risk students' construction of knowledge through interactions with others in the

transformative curriculum of Project S.M.I.L.E., this section discusses the history and development of social constructivism, the framework for this study. In addition, implications for a transformative curriculum within the context of social constructivism are considered.

Social constructivism has its roots with such theorists as Jerome Bruner, Karl Mannheim, and John Dewey (Berger and Luckmann, 1967; Doll, 1993). These theorists, among others, proposed the belief that one's knowledge is constructed within oneself, in harmony and conjunction with the experiences in a social frame (Berger and Luckmann, 1967).

Furthermore, this construction of knowledge within oneself is dependent upon interactions with others. Bruner, as reported by Doll (1993), argues, "The powers of mind represent the whole person, emotional as well as intellectual, in both reflective and social interaction with the environment" (p. 119). Berger and Luckmann (1967) also note that knowledge, or reality, is constructed with highly charged emotions. Without the emotional attachment to the social contexts, the learning process is, at best, difficult. This emotional attachment occurs within the learner in a relationship with significant others and the world. "All identifications take place within horizons that imply a specific social world" (Berger and Luckmann, 1967, p. 132).

It is this social interaction that Doll (1993) contends is inherent in all living systems, noting that each part of a living system is not defined separate from another. Instead, it is defined with respect to its relationship with other parts and with the whole system.

In the educational setting, Strommen and Lincoln (1992) propose that children actively construct their knowledge, invent their own ideas. "They assimilate new information to simple, preexisting notions and modify their understanding in light of new data" (p. 468).

This construction of knowledge is possible through the emphasis upon the whole group and the flow of activity between internal and external events (Taylor, 1971; Vygotsky, as cited by Au & Kawakami, 1984). Constructed reality is determined by the social group's unique vocabulary, which reflects their values and ways of life. Local reality or knowledge is subsequently experienced by the participants of such groups (Gergen, 1991).

Vygotsky, as reported by Au and Kawakami (1984), proposes that social constructivism is accomplished through examining the characteristics and patterning of interactions between children and teachers. Taylor (1971) contends the open school setting, where the teacher provides a wide variety of methods for the students to meet their assigned tasks, exemplifies the construction of knowledge.

It is interesting to note that as early as 1912, this social construction of knowledge through interaction was being documented. Dr. Arnold Gesell, in his book The Normal Child and Primary Education, spoke to the formal and rigid school settings by contending, "Children who grow up under such systematized direction are denied the very essence of mental growth, which depends upon original constructive effort" (Weinberg, 1971, p. 231). Doll (1993) follows this same premise almost a century later in recognizing that education is obtained by one being an active creator of knowledge.

Goodson (1990) ties curriculum into the realm of social constructivism through prescription, process, and practice. He contends that even though prescription--the systemic teaching of segments and sequences of a course of study--has been the embedded form of education in our society, it has led to the increased power of political and educational bureaucracies. According to Goodson (1990), the results have been catastrophic to curriculum studies. Therefore, the added dimensions of process (the development of curriculum through teacher professionalism) and practice (the systematic testing of ideas by the teacher) are essential to the social construction of curriculum knowledge. Furthermore, the integration of prescription, process, and practice should be at the preactive (the planning before action) and interactive (the reflection of

the action) levels. ". . . in this respect exploring the relational level would provide a strategy for strengthening and bringing together studies of action and of context in meaningful ways" (Goodson, 1990, p. 310).

Bredekamp and Rosegrant (1992) further propose that each perspective on curriculum development is important, but it is only in the interaction among the different perspectives that their true value is realized. Four properties that Bredekamp and Rosegrant (1992) contend will define curriculum within a sociocultural context are as follows:

1. conceptual organizers to ensure meaningfulness,
2. child development knowledge to enhance age appropriateness,
3. disciplined based knowledge to ensure that curriculum has intelligent integrity and worthiness, and
4. developmental continuum to ensure curriculum is individually appropriate.

Literature reports studies and programs that build on the social construction of learning (Banks, 1990; Nystrand, 1990; McCarthey, 1992). However, as in the research conducted by McCarthey (1992), many of the studies and programs describe social constructivism within the process of reading and writing instruction. In McCarthey's case study, the writing process is conducted using the social

interactions of the student of study, Ella, and her teacher. As Ella and her teacher interacted with conversation in conferences about the writing assignment, Ella framed her understanding of the conversations with her teacher in the creations of her own text. Lacking in literature are studies using social constructivism within the realms of elementary science education.

The social construction of knowledge aligns with the transformative curriculum development proposed by Doll (1993). His arguments that the reality of thought lies in experience not outside experience, that we construct thought rather than discover thought (Doll, 1990), support social constructivism.

Strommen and Lincoln (1992) describe a program in which curriculum is socially constructed. Middle school students in the computer class design their projects using curriculum content mandatory for the class. Although each student has access to a computer, students work together, sometimes in interchangeable groups. The role of the teacher is "as a member of a team and not the focus of the classroom" (p. 472). Students participating in this program produced meaningful projects through their socially constructed methodology. This program aligns with the socially constructed transformative curriculum proposed by Doll (1993).

Project S.M.I.L.E. is transformative in nature as it trains at-risk elementary students to be teachers who must plan and present science lessons to others. In this transformative curriculum, the students meet together to socially construct the lessons. In following Taylor's (1971) suggestion for socially constructed knowledge, the S.M.I.L.E. program emphasizes the whole group and the flow of activity between internal and external events.

Furthermore, the study at hand exemplifies Goodson's (1990) views of social constructivism by taking the science curriculum beyond the level of prescription into the realms of process and practice. As students on the S.M.I.L.E. teams explore lessons together, the process of their interactions and the practice of their science knowledge is vital to their teaching of science content (prescription) to other students.

As Project S.M.I.L.E. students explore the concepts they must present to others, organize their lessons to the appropriate age level of their students, and learn together the scientific content they are responsible for teaching, they meet the criteria for a socially constructed curriculum as described by Bredekamp and Rosegrant (1992). Also, as director of the program, I constantly interact with the S.M.I.L.E. students to ensure the teaching experiences are developmentally appropriate for each team member (Bredekamp & Rosegrant, 1992).

Conclusion

With the rise of the post-modern era, a new sense of educational order is emerging, manifested by a different relationship between teacher and student and culminating with a new concept of curriculum (Doll, 1993). As this review of literature suggests, a transformative curriculum builds on the social interactions of group study (Gadamer, cited by Doll, 1993; Strommen & Lincoln, 1992), the dialogue of "negotiating passages" with students and teachers (Doll, 1993; Gergen, 1991), and the interactions that are socially constructed between the student and knowledge (Bredekamp & Rosegrant, 1992).

Studies and reports reviewed in this chapter also indicate that the transformative curriculum is appropriate for at-risk children, specifically with the goal of developing their feelings of self-worth.

Existing literature supports the transformative curriculum for at-risk elementary and high school students. However, the reviewed literature only provides examples of this type of program for college, high school, and middle school students, i.e. the Student Study Center (Gray-Shoffner, 1986) and the Exploratorium's Explainer Program (Diamond et al., 1987). Studies of a transformative elementary curriculum are yet limited. Therefore, a study of a transformative elementary science curriculum provides a more complete understanding of how such a curriculum

influences elementary students, specifically at-risk elementary students, in the learning process of science.

The study at hand explored a program in an elementary school where a science curriculum, Project S.M.I.L.E., builds on the social interactions of at-risk students. By assigning the at-risk students to be academic leaders in Project S.M.I.L.E. rather than recipients of special tutoring, this program parallels the transformative curriculum suggested by Doll (1993).

CHAPTER 3

Research Methodology

Introduction

In order to determine ways a transformative curriculum may influence at-risk students and to explore the social interactions within a transformative curriculum that enhance self-worth, a case study was conducted at Alison Leigh Elementary School¹, located in a large metropolitan area of the desert southwestern region of the United States.²

This chapter describes the context, participants, research methods, data collection procedures, and data analysis of this study. The goodness of the study and limitations of the methodology are also discussed.

Research Context

Alison Leigh Elementary School serves approximately 580 fourth and fifth grade students, 60% of whom are on a free or reduced lunch program. This low socio-economic condition, along with other factors, classifies Leigh Elementary as an at-risk school by its school district's standards.

Because Leigh Elementary is a pilot school for its state in whole language development, several innovative programs have been established at this school site. One of the programs, the Science Museum and Instructional Laboratory for the Environment (Project S.M.I.L.E.) uses

fifth grade at-risk students as teachers in the science department. These students are trained to be curators of a natural history museum, housed in the school's foyer, and instructors in the science laboratory. Elementary students from throughout the school district come to S.M.I.L.E. for tours of the museum and lessons in the science laboratory. This program, based on a transformative elementary science curriculum, is my study's focus--the story of Project S.M.I.L.E.

The small natural history museum contains many important items, including fossils from the Paleozoic, Mesozoic, and Cenezoic Eras; a life-sized model of a sabre-toothed tiger; memorabilia from the building of Hoover Dam and the development of the Nevada railroads; artifacts from the mining industry of Nevada; specimens of rocks and minerals from Nevada; and a display of the plants and wildlife native to the Las Vegas wetlands. The science laboratory houses two 84 gallon aquariums; a science resource library; and extensive science equipment for the earth, life, and physical sciences.

By observing academic work and class participation, fifth grade classroom teachers identify three or four of their at-risk students who are withdrawn, struggling with their academic assignments, or low in social skills. These students are then members of the S.M.I.L.E. team.

This team, numbering 32 students, choose their area of expertise from the museum or science lab. Curators of the museum research their particular display and prepare a talk for visitors to the site, while the science lab team prepares lesson plans and teaches hands-on experiments for visiting students. These planning sessions occur out of the regular classroom for approximately two hours a week with me, the science resource teacher.

As the team members must direct their museum tour talks or lesson plans to the age level of the visiting class, they discuss their presentations with each other, give each other ideas in brainstorming sessions, and rehearse their presentations with each other. After each experience as tour guides and teachers, the students meet for a feedback session to discuss their successes, failures, ideas, and feelings.

Research Participants

Participants for this study were 17 members of the museum and science laboratory teams that volunteered to be part of this research. Some of the characteristics of the participants are included in Table 1.

Insert Table 1 about here

As I am the science resource teacher involved with Project S.M.I.L.E., I was also a participant observer

Table 1

Project S.M.I.L.E. Participant Characteristics

Gender		Ethninticity			Age	
Boys	Girls	Black (non-Hispanic)	White	Hispanic	10	11
41%	59%	48%	35%	17%	23%	77%

(Jorgensen, 1989) in this case study. As I researched material and prepared lessons with the students, I became a collegial learner with them. This kind of arrangement (i.e. being a collegial learner with the students) is part of the transformative curriculum described by Doll (1993).

Research Methods

Observing the students as they participated in Project S.M.I.L.E. and as they interacted with other persons within the project required methods that align with qualitative research. According to Yin (1989), research design depends on several factors: 1) the type of questions asked in the study, 2) the control the researcher has over the actual behavioral events, and 3) whether the focus of the study is on contemporary or historical incidents. Yin (1989) further states that qualitative research methods should be used if the questions for the study are how or why questions, if the researcher has little or no control over the behavioral events, and if the research focuses on a contemporary incident within some real-life context. As the study of Project S.M.I.L.E. met all of the criteria proposed by Yin (1989), the qualitative method of research design was appropriate. The participating student team was used as a single case study.

As I conducted the study of Project S.M.I.L.E., I observed and analyzed phenomena as it unfolded. This method of study aligns with the social constructivist framework, as

categories and themes were constructed through my interactions with the data.

Finally, as mentioned earlier, I was a participant observer in this case study of Project S.M.I.L.E. The methodology of participant observation requires that the researcher becomes directly involved with the participants' daily lives (Jorgensen, 1989). As the science resource teacher for this school and the director of Project S.M.I.L.E., I was in frequent contact with these students and their classroom teachers.

Data Collection

Mathison (1988) proposes that multiple sources of data collection, known as triangulation, should be used by the qualitative researcher. Triangulation improves the validity of the research as well as aids in the elimination of bias (Mathison, 1988). Therefore, several methods of data collection were conducted for the case study of Project S.M.I.L.E. Specifically, these methods of data collection were my journal entries of direct observations of the S.M.I.L.E. team participants as they conducted the tours and taught the science classes, students' journal writings, transcribed audio-taped feedback sessions that were conducted with the S.M.I.L.E. teams, and responses of parents and classroom teachers.

One method of data collection was the recording of observations I made while the students were performing their

duties as tour guides and teachers. I also made observations of the interactions the team members had with each other and with others involved with the program. These observations were recorded in my personal journal, along with reflective statements I added throughout the study. This method is supported by the naturalistic inquiry described by Guba and Lincoln (1982). They note:

The naturalist prefers humans-as-instruments for reasons such as their greater insightfulness, their flexibility, their responsiveness, the holistic emphasis they can provide, their ability to utilize tacit knowledge, and their ability to process and ascribe meaning to data simultaneously with their acquisition. (p. 245)

Second, the students kept reflective journals of how they felt before and after the teaching experience and what they remembered thinking during the presentations. I read journals of the team members participating in this study in order to collect data on the students' interactions with others and with their own emotions.

A third source of data collection was the feedback sessions directly following the teaching experience. After a visiting group left the school, the S.M.I.L.E. team gathered in the science laboratory for a discussion of how the teaching experience was perceived. Team members discussed their joys, problems, feelings, and suggestions for changes with future tour groups. These conversations were audio-taped and transcribed by me for data analysis.

Finally, data were collected from the teachers of the participating S.M.I.L.E. students with respect to changes in behavior or academia. Additionally, data were collected from parents or guardians of the S.M.I.L.E. participants for information on differences in behavior or attitude the students may have exhibited at home with regards to the goals of Project S.M.I.L.E. Data collection from the teachers and family were obtained through written statements or informal interviews. These data contributed to the categories and themes that emerged from Project S.M.I.L.E. at the school site by expanding the scope of data sources.

Data were collected during five months of Project S.M.I.L.E. During this time, the participating team of students met once a week for planning. Seven tours of the museum and science lab were conducted during the five months, usually lasting for two hours on Friday mornings. Observed data were collected from all tours, six of the planning sessions, and several of the regular science classes.

Data Analysis

Qualitative research may be analyzed by several methods, including letting the data speak for itself, interpreting the data through an accurate description, building theory, and developing a grounded theory (Strauss & Corbin, 1990). Grounded theory is developed through

inductive reasoning verified through the data collection and analysis. As Strauss and Corbin (1990) note:

Data collection, analysis, and theory stand in reciprocal relationship with each other. One does not begin with a theory, then prove it. Rather, one begins with an area of study and what is relevant to that area is allowed to emerge. (p. 23)

Because I began this study with broad objectives and questions, I chose to proceed with the grounded theory method for data interpretation.

Using the constant comparative method of data analysis, I interpreted the collected data through the open, axial, and selective coding processes (Strauss & Corbin, 1990). Open coding was accomplished by first transcribing and exploring all the data as they were collected in order to discover salient trends relative to the purposes of this study. Looking at the transcripts and observation notes line by line, by sentence or paragraph, and within the context of whole observation, I labeled the emerging concepts and grouped them into categories that seem to fit the same phenomenon.

Axial coding was then used to put the data back together in order to make connections between the categories, as described by Strauss and Corbin (1990). They note:

In axial coding our focus is on specifying a category (phenomenon) in terms of the conditions that give rise to it; the context . . . in which it is embedded; the action/interactional strategies by which it is handled, managed, carried out; and the consequences of those strategies. These specifying features of a category

give it precision, thus we refer to them as subcategories. (p. 97)

The axial coding process became extremely important to my data analysis of Project S.M.I.L.E., as the objectives of the study were related to context, strategies, and consequences of a particular phenomenon, a transformative curriculum.

By constantly comparing the categories and subcategories for similarities within the data, I used selective coding (Strauss & Corbin, 1990) to determine the core category of the Project S.M.I.L.E. study. This core category, or central theme, was named through the development of the study's story line. The central theme appeared in all data collected and analyzed within the particular categories.

After identifying this central theme, I continued to compare and question previous categories--now called subsidiary categories (Strauss & Corbin, 1990)--with relationship to this newly identified central theme. Furthermore, I validated this central theme through theoretical memos recorded in my journal throughout the study. My theoretical memos were recorded using both narration and conceptual mapping.

Finally, theoretical sensitivity contributed to the data analysis of my study of Project S.M.I.L.E. Strauss and Corbin (1990) define theoretical sensitivity as follows.

Theoretical sensitivity refers to the attribute of having insight, the ability to give meaning to data, the capacity to understand, and capability to separate the pertinent from that which isn't. (p. 42)

Through my professional experience as being the science teacher at the school and director of Project S.M.I.L.E., my personal experience of being a learner, and my analysis and questioning of the data itself, I met the criteria for theoretical sensitivity as suggested by Strauss and Corbin (1990).

Goodness of the Study

The validity of this study of Project S.M.I.L.E. is grounded in the suggestions of Guba and Lincoln (1982) through credibility, transferability, and confirmability. Credibility, defined by Guba and Lincoln (1982) as the quality or state of truth between the data of the inquiry and the phenomena those data represent, has been established by several means as suggested by Guba and Lincoln (1982). These include the following.

1. I was at the research site for a prolonged period of time, which helped to test biases and to identify characteristics of the context and the purpose of the study.
2. I conducted consistent observation of the participants during both the S.M.I.L.E. sessions and their regular science classes.

3. Upon several occasions I used peer debriefing to test insights of the study on uninvolved coworkers.
4. A variety of data sources, triangulation, was used for data collection.
5. Members of the participating S.M.I.L.E. team checked the data collection for accuracy throughout the study. Furthermore, the participating team read the final report.

Second, the transferability--how this study may relate to other populations, settings, and treatment arrangements--has been enhanced through using appropriate participants for the questions of the study and by providing a thick description of the context of Project S.M.I.L.E. (Guba & Lincoln, 1982).

Finally, confirmability, whether the results of this study could be confirmed by another researcher, was established within the data itself. The triangulation of data sources and my reflexive journal entries (in which I recorded my assumptions, reasoning, and biases of the study) provided this confirmability (Guba & Lincoln, 1982).

Assumptions Prior to the Study

Two assumptions were made going into this study of Project S.M.I.L.E. First, with respect to the theoretical framework of this study, I assumed that the science content the participating S.M.I.L.E. students acquired during their interaction with the curriculum would be socially

constructed. The program used time during the week for development of lessons and rehearsals for visiting tours, all of which contained a tremendous amount of science content. The students worked together to learn this information for presentation to visitors.

Second, as Project S.M.I.L.E. used students deemed at-risk of academic or social failure, I assumed the program would influence feelings of self-worth with the participants. This assumption was derived with the theoretical sensitivity I acquired from the study. Specifically, as director of the program, I had previously observed the increased self-worth with S.M.I.L.E. team members in their conversations with me and their peers that emphasized success and worthiness.

Limitations of the Methodology

During the study of Project S.M.I.L.E., several limitations of the prescribed methodology became evident. First, the theoretical framework of social constructivism limited the scope of analysis of the data. I reviewed and compared the collected data with respect to this framework; hence, additional theoretical frameworks were not used in the data analysis.

Second, being a participant observer in the study posed a limitation of over-familiarity with Project S.M.I.L.E. In order to transcend this phenomenon, I viewed the data openly with regards to its uniqueness. However, this limitation

was problematic and was overcome through the multiple sources of data collected and the constant comparative method of data analysis.

Finally, this methodology for the study of Project S.M.I.L.E. was limited in that I was not only a collegial learner with the students in this program, but I was also their science teacher in the regular school day. As my regular science classes during the course of a school day were conducted in somewhat of a more traditional setting, my role as the science class teacher was slightly misaligned with the transformative curriculum model proposed by Doll (1993). The students surely perceived this hierarchical structure; therefore, a limitation with data collection possibly existed.

Endnotes

1. All names, with the exception of Project S.M.I.L.E., used in this study of Project S.M.I.L.E. are pseudonyms to protect the anonymity of the participants.

2. Permission to conduct this study of Project S.M.I.L.E. was given by the school's principal, Teddie L. Brewer, on February 7, 1993. Refer to Appendix I.

CHAPTER 4

Research Results

Introduction

While collecting, categorizing, and analyzing the data from the study of Project S.M.I.L.E., four themes addressing the influence of a transformative science curriculum on elementary at-risk students emerged. These themes were 1) participation in scientific activities, 2) students-as-teachers, 3) student self-worth, and 4) student autonomy. This chapter describes these themes.

Additionally, each of these four themes pointed toward a central theme for the study, as described by Strauss and Corbin (1990). This central theme, student empowerment, is discussed separately.

Transcriptions of tape-recorded dialogues from the students, student journal entries, informal interviews of classroom teachers, correspondence from the students' parents, and my journal entries are reported to validate these themes.

Because there are no established guidelines for reporting the analysis of qualitative research (Merriam, 1988), I have organized this chapter by (1) describing the categories, or themes, and (2) relating the central theme for the study to these themes.

Theme One: Participation in Scientific Activities

In my role as the science resource teacher at the school, I noticed immediately the S.M.I.L.E. teams' increased participation in scientific activities. Science content constructed through the increased participation not only applied to the objects of the museum tours or lessons, but also to the particular areas being covered in the regular lab sessions for these students. Three weeks into this study I recorded in my journal the following observations of Matt, a S.M.I.L.E. team member who had not readily participated with his group during regular science class before his involvement with S.M.I.L.E. Matt's job with Project S.M.I.L.E. was to teach geology lessons in the science lab.

March 12, 1993

Today in science class, Matt was more attentive to the lesson. He not only participated with his group, but contributed in the group discussions following the experiment. He knew the process for classifying the rocks and minerals and was able to identify many of the specimens at his group's table.

Two days later I recorded the following observation in my journal regarding Tamika, a museum curator for Project S.M.I.L.E. and tour guide for the fossil display.

March 14, 1993

Tamika practically conducted science class today. Today's lesson was about the different time eras of our earth's history and the fossils of life from each era. Tamika took over. She told students in the class about the paleozoic, mesozoic, and cenezoic eras and of the different types of life and activity in Nevada during these times. She described the fossils on the tables to the class and encouraged them to handle [the fossils] with care. The class loved it!

Students also expressed a feeling of comfort in the increased participation in scientific activities. In reflecting on how the museum tour speeches were developed and executed, Lisa reported the following in one of the discussion sessions after a tour guide experience. Practicing for a scheduled tour gave her confidence to proceed with the activity she had prepared for the visitors.

I practiced in the mirror every night before the first time. Then [the] next time I thought this is so easy. Then this time I didn't want it to go by so fast.
(Lisa)

How Project S.M.I.L.E. influenced the process of learning science for students was reflected in a comment made by Janet, a student tour guide for the museum. She wrote in her journal, "While people are taking tours, and learning, the S.M.I.L.E. team is learning also." Furthermore, visiting teachers commented to me on the process of learning for the S.M.I.L.E. students. One teacher wrote to me in a letter, "Your students have certainly learned a tremendous amount of information about Nevada's history and environment while presenting these museum tours. Plus, their understanding of science concepts they have developed in order to teach the science lessons is amazing."

These statements above align with the social constructivist framework of this study which proposes that one's knowledge is constructed within oneself, in harmony

and conjunction with the experiences in a social frame (Berger and Luckmann, 1967).

Furthermore, as visiting students asked questions of the S.M.I.L.E. teams, the students worked with each other for support. During one tour, difficult questions were being asked by visitors to the museum. I observed S.M.I.L.E. students from other display cases in the museum helping team members that were struggling to answer the questions. Students had not only developed knowledge for their particular exhibits, but were attentive to the scholastic needs of their teammates.

Additionally, team members reminded each other of important information to be covered in positive ways. Students commented on this support during a team meeting.

It's neat, cause when Natalie and Joanne were doing their case, we would ask them questions cause they would forget to tell the little kids about things so we would remind them. (Janet)

Oh yea, we helped each other out. When they would say something, . . . she [a team member] would raise her hand and say, "What's that?" We were just acting like we didn't know what it was, and then the kids would say, "Yea, what's that?" (Raul)

Additionally, S.M.I.L.E. team students desired this increased participation in science activities as they met together during their recess time to make plans for lessons and tour presentations. Students researched topics together, sometimes assigning responsibilities to each other to increase efficiency for tour and lesson preparations. Many times, students met in groups to collectively

brainstorm ideas for their lessons. I noted in my journal the following during a planning session for a physical science laboratory lesson.

March 20, 1993

The students have come to the science lab for a thirty minute study time to prepare lessons for this week's group, a third grade class. They are working on activities for the physical science lessons to be taught. As a team, they have decided to divide the class into stations with a different activity for solids, liquids, and gases at each station. The students have chosen which station they each want to work with. Each station has three to four students.

One team is working on a lesson with dry ice and physical changes. They are discussing how to teach the concept of dry ice going from a solid straight to a gas. Andrea excitedly shouted, "I know, I know." She continued that they could have them [the visiting students] measure a certain amount of water in two containers. In one container they can put regular ice and in the other, they can put dry ice. Another student, Joyce, added that water should go up on the regular ice container, but not on the dry ice one. "That'll really freak them out." Other team members wanted to try that experiment.

For this theme, student participation in scientific activity and interaction with science content both increased with the students in Project S.M.I.L.E. This participation was evidenced during the academic lessons of regular science classes and during the students' planning sessions for S.M.I.L.E. tours. Furthermore, data suggested that the process of learning science content during the increased participation was attained by social interactions among the team members.

Theme Two: Students-As-Teachers

I developed a second theme of this study, students-as-teachers, from comments by students, parents, and classroom teachers. As S.M.I.L.E. students taught other students, both parties were more at ease with the interactional process of learning than with the authoritative role of the adult teacher. Tony and Will, participating S.M.I.L.E. team members, expressed their concern that younger students and older teachers cannot communicate effectively, causing a breakdown in the learning process.

Q: So, do you think kids learn more with kids teaching them?

Tony: Yea, kids learn more cause like you're closer to their own age, and teachers are older and you're like "Huh, what did you say? You're talking too fast."

Will: Teachers are more mature and kids think they can't understand them if they [teachers] teach them.

Tony: I think they learn something more from their own age than from lots older age. . . Closer to your own age they know what you're saying and stuff.

Tony felt a sense of accomplishment with his teaching of another student. He acknowledged the process of learning through experience for the student he was teaching.

Tony: This one kid said, "This isn't Koolaid, these are blocks," and I said, "It's really Koolaid, but you

see microscopes help you see what it really looks like."

Q: How did you feel when they left?

Tony: I felt like they learned something. I felt happy.

In a conversation I had with Christy, I learned that she was not always willing to help out with the math tutoring of her younger sister at home. However, after becoming experienced with Project S.M.I.L.E., she began to assist her younger sister. Christy had a strong opinion about the learning process of the student with regards to the age of the teacher as she noted:

My sister didn't understand division and when I explained it to her she said I explained it to her better. But I said, "No, you just understand it better from me cause I'm a kid." (Christy)

Zak and Raul felt that their roles as students-as-teachers enhanced the process of learning through an exchange of dialogue. Doll (1993) argues that this process is a critical aspect of the transformative curriculum.

I think it's neat, cause you can teach the little kids things, adult things, and they can teach you things you don't know. Like a trade. (Zak)

This is the best day of my life. I got to work with people, little kids and stuff. It's like we were the teachers now and their teachers were like our students because they were asking questions and listening to us. (Raul)

One visiting group of fourth and fifth grade students were members of a class for emotionally disturbed and learning disabled students. The visiting teachers commented to me that they had never seen their students so "tuned

into" learning. Their normally short attention spans were not evidenced during the S.M.I.L.E. students' presentations. Furthermore, they stayed on task in the science laboratory with their activities. The teachers also expressed surprise in their students' adjustment to the S.M.I.L.E. team's learning stations as their students had not experienced this learning center approach prior to this visit. "We just didn't trust what could happen. This is unbelievable!"

Comments were also made during this tour as to how the S.M.I.L.E. students handled problems. One teacher said, "I'm taking notes on their management skills. I've certainly learned some things from your students today."

Sabrina demonstrated the social constructivist views with her feelings. She expressed in her own ways what many of the theorists have professed regarding the construction of learning (Berger & Luckmann, 1967).

I think they learned more cause they got to go the way they wanted. Then when you get to go where you want, you can understand it better, and if you don't understand it, you just go where you do understand it.
(Sabrina)

Theme Three: Student Self-worth

The third theme which emerged in the study of at-risk students participating in Project S.M.I.L.E. was that of student self-worth. Students participating in the research consistently wrote in their journals, discussed, and exhibited the importance of this theme.

Self-worth was developed within the students as they matured in the S.M.I.L.E. teaching experiences. Students reported being nervous before the visiting tours, then felt a sense of accomplishment and importance following the experience. In reference to a group of touring principals, Zak reported the following:

Well, it felt kind of weird because you go from talking to little kids to adults and I felt really nervous. But [later] I felt good because they complimented us and stuff. They said we could pronounce words that they couldn't. (Zak)

Robert added to Zak's comment:

It was like kind of exciting and I was nervous at first cause I had not done this before. But, the guys [principals] said, "You'll do just fine." And that's what got me going so I could just speak out and say it. (Robert)

Many of the S.M.I.L.E. team members attributed the growth of self-worth to their higher knowledge level and the importance of the position on the team. Following are comments made by several of the S.M.I.L.E. team members with regards to this feeling of self-worth.

"I feel great because they didn't know something I knew." (Dionne)

"I felt important--more important than I have before." (Maria)

"This is the best day of my life." (Zak)

Zori noted the following in her journal.

I feel important, good, terrific, special that I am a member of the S.M.I.L.E. team, and I feel very important when I'm talking to kids. I feel super duper

important that I know something that they don't. I'm glad I'm a special team member of S.M.I.L.E.

Parents expressed the heightened self-worth of their children as participants of Project S.M.I.L.E. In an evaluation report I requested from the S.M.I.L.E. team parents at the end of the year, one parent wrote,

Suzanne has felt special by being a part of the program. She has kept up with her work and has loved being a part of the S.M.I.L.E. project. Thanks for letting her take part.

Self-worth was also exhibited with relationship to cultural pride. Displaying positive feelings about themselves, some of the S.M.I.L.E. participants desired to share, even teach, their culture with visiting students. I noted the following in my journal with relationship to this aspect to self-worth.

May 9, 1993

Today was something else. I never would have guessed for this to happen. During the fifth grade tour, students were busy in the science laboratory. I noticed that many of the Black members of the team were gone. (All of the visitors are white.) I was wondering if something had been said to hurt my students or to anger them, something racial. I went out of the lab into the hallway to look for them. There eight of them were, practicing a dance from the movie Cadence. I asked them what they were doing. They replied that they wanted to teach the visiting kids this dance. Now what to do? This had nothing whatsoever to do with science. Should I let them? I decided to take my chances and stay out of this. They shortly came into the classroom and announced to all the visiting students that they wanted to teach them something else. They proceeded with the dance. All of the students loved it and joined in. We teachers sat back, laughed, and enjoyed the exchange. After a short amount of dancing/singing time, all of the students returned to their stations to continue their science lessons. The atmosphere was relaxed, comfortable, happy, and conducive to learning.

As this dance was symbolic of cultural acceptance and appreciation in the movie, Cadence, it was amazing to witness this within the realms of Project S.M.I.L.E. The team members' self-worth was certainly demonstrated during this cultural sharing.

Theme Four: Student Autonomy

Finally, the data from this study of the influence of a transformative elementary science curriculum, Project S.M.I.L.E., suggested student autonomy. Autonomy is defined by Funk and Wagnalls Dictionary (Landau, 1993) as "the power or right of self-government, self-determination, independence" (p. 43). This characteristic was evident within the program itself, within the regular classrooms, and within the students' homes.

Knowing their responsibilities to the team and the program, S.M.I.L.E. students were always on time for working sessions, rehearsals, and tours. These responsible actions were a result of the students' self-determination to see the success of Project S.M.I.L.E. I noted the following observation four weeks into the study.

March 28, 1993

Everyone showed up on time today with their lesson plans ready to go. The museum team rehearsed with each other in the hallway. I noticed they were helping each other with how to change their "talk" to the level of kindergarten age students. The lab team worked really hard to get a geology lesson ready for the little ones. They did not ask for any help from me.

Several touring sessions later, I noted in my journal another example of this responsible self government. The visiting children were fifth grade gifted students from a wealthy area in the southeast section of Las Vegas. I recorded the following:

May 15, 1993

My S.M.I.L.E. team is really nervous today. Several of them do not want to do this tour. They seem to feel intimidated by the fact that the students coming are fifth graders in the gifted program. . . . Robert just came up to me and said he would not do the Saber-tooth talk. Started to walk away. I walked after him and asked why. He said that he was just not feeling good. Maria joined us in the hall. [She's in charge of the fossil case.] She said to Robert that she had been really scared, but that after she got started, it was like any other time except that she felt especially great doing it this time. She told Robert that he was a member of the team and had a job. "What will Maurice [his partner] do if you leave?" Robert walked back to his case and presented his talk. He did a good job, and had a huge smile when finished.

During the same tour, Rose had a similar experience in the science laboratory. Again, Rose's feeling of intimidation from the fifth grade visiting students seemed to cause a problem with her lesson. She was in charge of the fresh and salt water aquariums. I noted in my journal the following:

May 15, 1993

All the visitors were lined up by the salt water aquarium waiting for Rose to begin. She just stood there. I've never seen such a blank stare before. I went up to stand next to her and introduced her to the group. She leaned over to my ear and whispered, "Mrs. Grimes, I can't do this." I replied back to her, "Who else could better than you?" I started a brief story of the aquarium, then I asked Rose about some of the fish. She stepped in reluctantly, but the visiting students started asking her questions so rapidly that

she did not have time to think about being scared anymore. She did her job well.

These students had the courage to stick with their assigned tasks under adverse conditions. This exemplified their responsibility in carrying out their jobs, their autonomy.

Furthermore, classroom teachers at Leigh Elementary School noticed a difference with some of the S.M.I.L.E. team members. As the student team members became more comfortable and confident with their roles as S.M.I.L.E. teachers by setting their own pace for planning and presenting their lessons, they became more vocal within their normal classroom. One teacher commented to me about Iris, a once extremely withdrawn student, "Can we do a reversal on her now? She 'contributes' in class all the time."

Many of the S.M.I.L.E. team members spread their wings to other areas, feeling their new autonomy. One teacher noted, "Several of my S.M.I.L.E. team students not only have kept up with their work while being away from the classroom on S.M.I.L.E. business, but have now joined other organizations in the school, i.e. the photography club and the honors chorus."

Responsibilities of helping out at home, especially with assisting a younger sibling with schoolwork, were also noticed by some of the parents of S.M.I.L.E. team members.

For example, one parent commented, "My daughter does not whine anymore when I ask her to help her sister [with homework]. She seems to like teaching Katie."

Student autonomy was observed as an important influence in the at-risk students within the transformative curriculum of Project S.M.I.L.E. Through the development of this autonomy, the student team members exhibited responsibility in their regular classrooms, Project S.M.I.L.E., and their homes.

Central Theme: Student Empowerment

As each of the reported themes emerged during the study, a central theme (Strauss & Corbin, 1990) became evident. This central theme, student empowerment, was a collective function of the other themes.

I first noticed student empowerment during a discussion with S.M.I.L.E. students after several tours had participated in the project. Feeling as though they could accept any challenge, the S.M.I.L.E. students' empowerment was evident from this recorded discourse.

Tony: We want to do this more.

Sabrina: Yea, older.

Tamika: We're like grown-ups. We can take care of this.

Sufia: Junior high!

Q: You want to tour a junior high group?

Tamika: Houston [Middle School].

Tony: My cousin goes to Bush [High School].

Q: What grade would you like?

Several students: Sixth--sixth grade!

Alex: Any grade--any grade!

However, this empowerment felt by the S.M.I.L.E. team members was very fragile. It was only after discovering the fragile nature of this new empowerment that I was able to see its relationship within the other themes of the study.

Only a few weeks before the completion of the school year and, subsequently, the end of Project S.M.I.L.E. for these fifth grade students, a class from a school in the southeast section of the city came to visit. Not only was the level of the socio-economic environment substantially higher for these visitors than the S.M.I.L.E. team members, but the visitors were also categorized as fifth grade Gifted and Talented students. These visitors were scheduled for two Friday visits, one week apart. In my journal prior to the arrival of these visitors I noted the following:

May 15, 1993

My team is extremely nervous. Several of them do not want to do the tour or the lessons. Maybe I should not have told them that the kids are from the G.A.T.E. program. I have asked their classroom teachers if they can have more time for rehearsals and preparation during this week. Most have said that is fine. Team members are literally jumping around. Very nervous.

The surprise came during the museum tour. The S.M.I.L.E. team adjusted quickly to the visiting students, but the challenge of empowerment came from the visiting teacher. She interrupted the S.M.I.L.E. students'

informational talks several times to give additional information for some of the museum displays. As a teacher observing this, I did not readily see any problem with the visiting teacher offering the additional information. However, team members were shaken, confused, and even angry at these interruptions. The S.M.I.L.E. students viewed the interruptions as challenges to their leadership with scientific knowledge, autonomy, self-worth, and worthiness as teachers. Their empowerment was threatened.

This threatened empowerment is reported in the following dialogue of S.M.I.L.E. participants during a post-tour feedback discussion. Not only are all previously reported themes mentioned, but the themes' relationship to empowerment is of significance. The increased participation in scientific activities, the students-as-teachers method of learning, the students' self-worth, and the students' autonomy are all challenged. I have not separated these themes in this dialogue so as to preserve the context of impending threat these students experienced in such a short time.

Tamika: It was fun. Before they came in, we wanted to tell them to just back off cause they were so smart. When they got here, we were running around like, "Oh, my gosh, they're here!" At the first when we started, it was easy. But, [then] . . . the teacher--she just kept cutting everybody off and saying everything.

Lavell: She just started making up her own stuff like she was saying to Iris, "Please talk slower and talk clearer." Then she started talking about the [museum] case.

Maria: Yea, it wasn't like Mr. Brock did with his class. You know, when he had something to say, he would raise his hand and ask us if he could tell something more. Stuff he said was neat but he did it in a nice way.

Q: Why do you think she acted like that?

Tony: Cause she was jealous. Cause of her kids. She felt like we can't do it. Like we couldn't even learn.

Iris: She probably thinks we're stupid cause we're not her kids.

Tamika: She takes away from our time to tell her stories. She could tell them at her own school, but at the time we're trying to tell something, she has to tell.

Robert: I felt like she didn't want us to learn anything and see how it feels, cause every time we would get ready to say something, she would say it. It made us feel like we didn't know anything.

Suzanne: Maybe she thought that since she was the teacher she had the right to speak whenever. I got mad when she said, "Did you guys see that thing in the newspaper where they found the body of a whole mammoth?" And we go, "No, we haven't heard of it." And she looked like "Oh." (made face)

Iris: I felt stupid today once cause that teacher, when they were fixin' to explain that first case, she would go ahead and say it out. It made us feel like we didn't know anything.

This dialogue reflected the paradigm shift occurring within Project S.M.I.L.E. of traditional and non-traditional methods of instruction. In a setting that required non-traditional interactions with students, a teacher imposed a traditional format for learning. This conflict in paradigms produced a threat to the at-risk S.M.I.L.E. students.

Furthermore, the empowerment's fragility was evident during the last meeting of the school year we had as a team.

We were discussing the future of S.M.I.L.E. and the students' moving on to middle school. The fear these students had of losing the newly acquired empowerment became apparent.

Rose: We have to leave. I don't want to leave. I like it here.

Rich: You know how junior high gets out at two something? So, I could get out over there and come over here and work on the S.M.I.L.E. team.

Lavell: That's true. We could get to know more about our [museum] case.

Summary of Themes

As at-risk students participating in Project S.M.I.L.E. prepared and conducted the museum tours and science laboratory lessons, they exhibited an increase in scientific activities, heightened self-worth, experience with being students-as-teachers, and student autonomy. These characteristics were integrated with each other, depending on each other for existence and growth. Throughout the study, the central theme of student empowerment became evident. This central theme was also integrated with the four original themes.

As these at-risk elementary students began their training in Project S.M.I.L.E., data suggested that their participation in scientific activities increased. This participation gave the S.M.I.L.E. students a willingness to be teachers to others and to voice their opinions as to the significance of such a program.

Moreover, as the students became more proficient in their teaching, their self-worth seemed to increase. In turn, this development of the students' self-worth moved toward autonomy of the S.M.I.L.E. students. Data collected from parents, classroom teachers, and my journals corroborated these findings.

Data further suggested that the emergent Project S.M.I.L.E. characteristics were integrated, all within the realm of student empowerment. Additionally, this student empowerment, woven throughout the study, was found to be extremely fragile. For example, when the participation of the S.M.I.L.E. teams' science activity was interrupted, the worthiness of being a students-as-teacher, the self-worth of the students, the autonomy of the students, and the empowerment of the students were diminished.

When the S.M.I.L.E. students prepared for the tours, they worked together acquiring knowledge and confidence for the student-as-teacher experience. The ideas, research, and lessons were socially constructed. Furthermore, the S.M.I.L.E. students assisted each other during stressful moments during the tours. For example, when one of the student tour guides forgot an important point, other student team members were helpful. Interestingly, this help from fellow teammates did not threaten the S.M.I.L.E. students' empowerment. It was the help from the visiting teacher that offended the teams and threatened their empowerment.

CHAPTER 5

Summary, Working Hypotheses, and Implications

Introduction

This case study explored the influence of a transformative elementary science curriculum on at-risk students. The program, Project S.M.I.L.E. (Science Museum and Instructional Laboratory for the Environment), uses at-risk fifth grade students as teachers and curators of a natural history museum and science lab at Alison Leigh Elementary School.

Using data collected throughout the study, I explored influences of a transformative curriculum in elementary science education for at-risk students.

This chapter summarizes the findings of the study, discusses four working hypotheses that emerged from the study, and considers implications for elementary curriculum and further research. The working hypotheses and implications of the study relate to the transformative elementary science curriculum and at-risk students.

Summary of the Findings

Participation in scientific activities.

Students participating in Project S.M.I.L.E. became more active in science activities. This increased participation was evident in the regular classrooms, the

science laboratory classes, and the Project S.M.I.L.E. tours. As the students gained experience with teaching others, their participation with additional academic situations also increased.

Furthermore, the increased participation in the scientific activities exhibited learning in the social constructivist setting. For example, students forfeited recess time in order to work together for the development of the science lessons and tours in their commitment to the student-as-teachers program.

Students-as-teachers.

The second finding of this case study was the commitment of the participants to the students-as-teachers program that Project S.M.I.L.E. exemplifies. The participating students had a firm belief in the effectiveness of the program. They enjoyed the teaching experience and, in turn, their students responded favorably to the tours and lessons. Additionally, adult visitors expressed that they had learned science content and classroom management skills from the S.M.I.L.E. students.

Families of the team members expressed added confidence in their children with helping younger siblings in homework. Furthermore, S.M.I.L.E. team members strongly voiced the value of students teaching students, whether at home or at school. The students-as-teachers experience led to an

increased sense of well-being, or self-worth, with the Project S.M.I.L.E. participants.

Self-worth.

As the students conducted their duties within Project S.M.I.L.E., their self-worth seemed to increase. The team members' superior knowledge in science to that of their "students" and the participants' maturity in the teaching process were significant to this increase in self-worth. Data collected from the S.M.I.L.E. team members as well as their families proposed this finding.

Furthermore, these at-risk students in Project S.M.I.L.E., many having been identified by their classroom teachers as withdrawn, became so confident in themselves that they exhibited their self-worth through pride in their culture. This heightened self-worth advanced toward the development of the students' autonomy.

Student Autonomy.

Student autonomy, defined as self-governing independence, developed as a result of the transformative curriculum of Project S.M.I.L.E. Not only had the students prepared and executed the tours and lessons in the program, but they also accepted the responsibilities of staying current with their classroom work. Furthermore, this autonomy surfaced in other situations for the S.M.I.L.E.

students as many of the team members became active in other clubs in the school.

Student Empowerment.

A collective finding of the themes reported above for the students-as-teachers program of Project S.M.I.L.E. was student empowerment. Furthermore, data suggested this student empowerment to be extremely fragile. As a conflict between traditional and non-traditional (modern and post-modern) paradigms occurred, student empowerment was threatened. Subsequently, the original themes were threatened, due to the integrated nature of these themes.

Working Hypotheses

Four working hypotheses were generated from the data of this study (Lincoln & Guba, 1985). Transferable to similar contexts and samples of participants, these hypotheses are useful for discussing the influence of a transformative elementary science curriculum on at-risk students.

Hypothesis One.

A transformative elementary science curriculum may empower at-risk students in academic, extracurricular, and social contexts.

This study revealed that at-risk elementary children welcome the transformative curriculum suggested by Doll (1993). The participating students became more involved in scientific study, clubs, and social interactions. As

collegial learners with teachers, the students felt empowered by experiencing the "negotiated passages" proposed by Doll (1993). This empowerment was the result of the students' development of self-worth, fostered by the leadership positions they enjoyed in Project S.M.I.L.E.

Hypothesis Two.

A transformative science curriculum's use of social interactions in learning may enhance student self-worth, a factor lacking with many at-risk elementary students.

Literature reviewed in Chapter 2 proposes that at-risk students from low socio-economic environments have low self-worth (Mizell, 1986; Covington, 1984; Jarolimek, 1983). Furthermore, there are existing programs which use social interactions in educational settings for high school students leading to the enhancement of the students' self-worth (Gray-Shoffner, 1986; Diamond et al., 1987). Lacking in literature are studies using the social interactions of a transformative curriculum in the elementary school for at-risk students. This study of Project S.M.I.L.E. supported the earlier findings of Diamond et al. (1987) and Gray-Shoffner (1986) by revealing enhancement of the at-risk elementary students' self-worth.

Hypothesis Three.

Academic leadership positions for at-risk elementary students, as evidenced by a transformative curriculum, may enhance the students' autonomy for teaching science.

Self-government, independence, and self-determination (autonomy) were qualities of the students participating in Project S.M.I.L.E. This autonomy was enhanced by the position of leadership these students experienced, as revealed by this study. Studies exist which describe at-risk elementary students receiving special tutoring (Pino, 1990; Levine, 1986; Land, 1984); however, programs that place at-risk elementary students in the position of imparting knowledge are virtually non-existent. The transformative curriculum of Project S.M.I.L.E. gave the participating students experience in being academic leaders, thus enhancing their autonomy.

Hypothesis Four.

Student empowerment as a socially constructed transformative phenomenon may be threatened by traditional power relations between teachers and students.

As students socially constructed learning within the transformative curriculum of Project S.M.I.L.E., traditional methods of learning threatened its success. When a visiting teacher to the program intervened in the student's

presentation with information of her own, the resulting loss of student empowerment may have been the result of a traditional model of education being forced onto a non-traditional setting. Furthermore, when students on the S.M.I.L.E. team offered assistance to other team members, it was deemed as acceptable, even desirable, by the students. In the latter case, the assistance was internalized by the team members as student interactions in a non-traditional, transformative environment for learning.

Implications for Elementary Curriculum and Future Studies Elementary Curriculum.

Five implications for the development of a transformative elementary science curriculum are presented in this section. All of the implications were formed from my interpretations and judgements about the data (Wolcott, 1990). These implications provide educators with possible insights into transformative curriculum development for the post-modern era.

1. Challenge elementary curriculum which uses the traditional modernist approach with at-risk students, where teachers are viewed as an authoritarian rather than as a facilitator in the learning process.

Literature reviewed in this study revealed that using the authoritative teaching strategy with at-risk students of the low socio-economic community is practically futile (Jarolimek, 1983; Covington, 1984; Mizell, 1986). A

transformative curriculum which involves the at-risk student in decisions and problem solving through active communication moves the educational setting into the same era as society. At-risk students in this study were given the opportunity to be academic leaders, decision makers, and collegial learners. As a result, these at-risk students did progress in academic participation, social interactions, autonomy, and self-worth--without the use of authoritative tactics.

2. At-risk students' empowerment is central to a transformative curriculum.

As many at-risk students are not empowered by their home and school environments, their sense of control in an educational setting is limited. Throughout this study, the empowerment developed by the at-risk students was evident, resulting in educational advancement. A transformative curriculum for elementary at-risk students should emphasize this empowerment.

3. Transformative curriculum development needs to acknowledge that empowerment of at-risk students is tenuous and easily threatened.

Although empowerment is a result of the non-authoritative, transformative curriculum, it is also easily threatened by the traditional power relationship between teachers and students. In the traditional setting, teachers are viewed as the authority of all knowledge. Therefore,

the teacher's role is to impart their knowledge to students. A conflict occurs inside at-risk students who have become empowered in their learning through a non-traditional, transformative model of education. A traditional teacher might assume that students can easily survive the corrections, accusations, or inferences that are delivered many times during the course of a school day. Perhaps, students who are not at-risk can accept criticism and proceed. However, this study revealed that at-risk students cannot survive even the slightest threat upon their empowerment. Students in the study at hand voiced their objections to the situation where the traditional teacher threatened their empowerment; however, they did not address this concern to the teacher. As they returned to the non-traditional environment of the S.M.I.L.E. curriculum of group discussion, their voices were heard. However, the traditional teacher never knew what she had done. This would imply that this situation may occur many times throughout the course of a school day without our knowledge.

4. Challenge elementary curriculum which does not include social interactions of the students as an important component.

Within the transformative curriculum of this study, social interactions were of predominant importance. As the participating at-risk students socially constructed the

lessons together, they formed science understandings worthy for teaching to other students.

This study clearly revealed the students' strong feelings of the importance of the students-as-teachers feature of the transformative curriculum. Students teaching other students was extremely successful in the educational development for all of the participants. This feature of the transformative curriculum was paramount in the development of the at-risk students' empowerment.

Furthermore, at-risk students' empowerment is not challenged by social interactions of other students. Students in this study viewed visiting teachers as traditional authority figures, interpreting their suggestions to be rude interruptions and statements of student incompetency. However, as their fellow team members offered suggestions and assisted in the presentations, the students were receptive and viewed their involvement as acceptable, even desirable.

5. Pre-service teacher education needs to teach strategies for the transformative curriculum in elementary education.

In order for the transformative curriculum to be successfully implemented into the elementary setting, teachers need to be educated in its rationale and methods of teaching. Literature reviewed in this study suggested that our teacher pre-service programs do little to instruct

teachers in the art of engaging students in dialogue, a key component in a transformative curriculum (Doll, 1993). Classroom teachers are burdened with demands of curriculum in the modernistic setting. Consequently, teachers are often unaware of how to engage their students in the negotiated passages of a transformative curriculum. University and professional development classes need to address the transformative model of curriculum in order to empower the teachers in this new movement.

Future Studies.

Longitudinal research on the influence of a transformative science curriculum for at-risk elementary students as they proceed to middle schools is needed to study the continuation of the program. What time frame is necessary for the at-risk student to own empowerment and successfully face challenges to this empowerment?

Research into the acceptance of the transformative curriculum by elementary teachers is needed. What are the detriments of such a curriculum as seen through the eyes of the classroom teacher? What changes are needed by university pre-service programs to introduce new teachers to this new curriculum approach? What obligations do school districts have in the education of currently employed classroom teachers toward this new trend in curriculum development?

Third, future studies should focus on the nature of the science content that students actually acquire as they as they become students-as-teachers. Does scientific knowledge increase effectively with the transformative curriculum as opposed to the modernistic approach?

Finally, research on the students-as-teachers methods of teaching could be of importance. What schemata do they bring with them to the teaching experience? Do the students teach in the traditional, modern paradigm? Do they become facilitators for their students, using the transformative paradigm which they themselves are experiencing as students?

Conclusion

Of concern to this study was the impact of change from the modern to the post-modern eras on the at-risk elementary student, specifically from the low socio-economic environment. Curriculum reform for at-risk elementary students is crucial for a new societal order, as these students, in particular, do not respond favorably to the authoritative demands of the modern era. Furthermore, literature suggests that these students have low levels of self-worth. Therefore, a curriculum which develops this self-worth in the at-risk elementary student is warranted. The transformative curriculum suggested by Doll (1993), Bredekamp & Rosegrant (1992), and Strommen & Lincoln (1992) meets the needs of these students.

This study explored the influence of a transformative elementary science curriculum on at-risk students. The program, Project S.M.I.L.E., uses at-risk fifth grade students as teachers in a science laboratory and curators of a school natural history museum. Although a better understanding of the influence of a transformative curriculum on at-risk students emerged, additional research is needed to validate the findings of this study.

The world of the at-risk elementary student is complicated. Our society has changed dramatically, but our public schools have been slow to change. As Strommen and Lincoln (1992) propose, . . . "the schools are mismatched to the children. Only by revising educational practice in light of how our culture has changed can we close this gap and reunite our schools with our children and the rest of society" (p. 475).

How can we ask our children to read chapters in a book and answer possibly irrelevant questions proposed by the text's author when the means exist to empower those same students to frame their own questions and research their own answers? Without a transformative curriculum, at-risk elementary students will continue to struggle through their formal education, possibly resulting in higher drop-out rates than are currently documented by many low-income school districts. Immediate attention to curriculum reform is vital.

Appendix I
Case Study Consent Form

CASE STUDY CONSENT FORM

Investigator: M. Katheryn Grimes
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Las Vegas, NV 89115
Home: 454-0787 Work: 799-4970

The purposes of this project are:

1. To satisfy thesis requirements for Master of Science Degree, UNLV,
2. To learn about the influence of a transformative curriculum on at-risk students, and
3. To evaluate the effectiveness of Project S.M.I.L.E., a new science program at the school.

I, Teddie Lynn Brewer, principal of the elementary school housing Project S.M.I.L.E., understand that:

1. The information obtained during this project will be used to write a case study which may be read by the participants, the thesis instructor, and one class member at UNLV who will conduct a check of the data. The case study will not be disseminated to others without this written permission.
2. The information obtained will also be used to develop theories regarding a transformative curriculum. The data will be used in a master's thesis.
3. The information obtained will also be used to evaluate the effectiveness of a new science program at the school, Project S.M.I.L.E.
4. Real names will not be used during data collection or in the written case study.
5. Data will be made available only to the participants, the thesis instructor, and one UNLV class member who checks the data.
6. I am entitled to review the case study and thesis before the final draft is written and negotiate changes with the investigator.
7. I will receive a copy of the final case study within one week after its completion.
8. I may withdraw the participants from this study at any time by speaking to the investigator and all data collected from the study will be returned immediately.

I agree to allow our school community to participate in this case study according to the preceding terms.

Respondent: Teddie Lynn Brewer Date: 2/12/93

References

- Ames, L., Gillespie, C., & Streff, J. (1972). Stop school failure. New York: Harper & Row.
- Au, K., & Kawakami, A. (1984). Vygotskian perspectives on discussion processes in small-group reading-lessons. In P. L. Peterson, L. C. Wilkinson, & M. Hallinal (Eds.), The social context of instruction (pp. 209-225). New York: Harcourt Brace Jovanovich.
- Banks, J. (1990). Citizenship education for a pluralistic democratic society. Social Studies, 81(5), 210-214.
- Berger, P., & Luckmann, T. (1967). The social construction of reality. Garden City, NY: Doubleday.
- Bredekamp, S., & Rosegrant, T. (1992). Reaching potentials: appropriate curriculum and assessment for young children (Report No. NAEYC-225). Washington, DC: National Association for the Education of Young Children. (ERIC Document Reproduction Service No. ED 352 160)
- Cohen, P., Kulik, J., & Kulik C. (1982). Educational outcomes of tutoring: A meta-analysis of findings. American Educational Research Journal, 19(2), 237-248.
- Colorado Council for Learning Disabilities (1992). Research in the classroom (Document No. RIEDEC92). Denver, CO: Colorado State Department of Education. (ERIC Document Reproduction Service No. ED 347 765)
- Covington, M. (1984). The self-worth theory of achievement motivation: findings and implications. The Elementary

- School Journal, 85(1), 5-20.
- Cremin, L. (1961). The transformation of the school. New York: Random House.
- Diamond, J.; John, M.; Cleary, B.; Librero, D. (1987). The exploratorium's explainer program: the long-term impacts on teenagers of teaching science to the public. Science Education, 71(5), 643-656.
- Doll, W., Jr. (1990). Teaching a post-modern curriculum. In J. T. Sears & J. T. Marshall (Eds.), Teaching and thinking about curriculum (pp. 39-47). New York: Teachers College Press.
- Doll, W., Jr. (1993). A post-modern perspective on curriculum. New York: Teachers College Press.
- Gergen, K. (1991). The saturated self. New York: Basic Books.
- Giroux, H. (1991). Post-modernism, feminism, and cultural politics. Albany, NY: State University of New York Press.
- Goodson, I. (1990). Studying curriculum: towards a social constructivist perspective. Journal of Curriculum Studies, 22(4), 299-312.
- Gray-Shoffner, C. (1986). A rescue program for potential dropouts. Principal, 66(2), 53-54.
- Guba, E., & Lincoln, Y. (1982). Epistemological and methodological bases of naturalistic inquiry. Educational, Communication, & Technology Journal, 30(4),

233-252.

- Harbin, G. (1991). Defining the eligible population: policy issues and challenges. Journal of Early Intervention, 15(1), 13-20.
- Jarolimek, J. (1981). The schools in contemporary society. New York: Macmillan.
- Jorgensen, D. (1989). Participant observation. Newbury Park, CA: Sage.
- Land, W. (1984, November). Peer tutoring: student achievement and self-concept as reviewed in selected literature. Paper presented at the Annual Conference of the Mid-South Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 252 302)
- Landau, S. (Ed.). (1993). Funk & Wagnalls Standard Desk Dictionary. New York: Harper & Row.
- Levine, M. (1986). Docemur docendo (he who teaches, learns). American Educator: The Professional Journal of the American Federation of Teachers, 10(3), 22-25.
- Lincoln, Y., & Guba, E. (1985). Naturalistic Inquiry. Beverly Hills: Sage Publications, Inc.
- Mathison, S. (1988, March). Why triangulate? Educational Researcher, pp. 13-17.
- McCarthy, S. (1992). The influence of classroom discourse on student texts: the case of Ella. (Research series no. 211). East Lansing, MI: Michigan State University,

- National Center for Research on Teacher Learning. (ERIC Document Reproduction Service No. ED 342 016)
- McCracken, T. (1987, May). Double coding: Some characteristic differences between modernism and postmodernism and the implications for honors education. Paper presented at the conference of the National Institute for Staff and Organizational Development, Austin, TX. (ERIC Document Reproduction Service No. ED 296 916)
- Mehan, H., & Wood, H. (1975). The reality of ethnomethodology. New York: John Wiley & Sons.
- Merriam, S. (1988). Case study research in education. San Francisco: Jossey-Bass Publishers.
- Mizell, M. (1986). Considerations preliminary to the development of dropout prevention policies and programs. ERS Spectrum, 4(4), 21-27.
- Nencel, L., & Pels, P. (1991). Constructing knowledge. Newbury Park, CA: Sage.
- Nystrand, M. (1990). Sharing words: The effects of readers on developing writers. Written Communication, 7(1), 3-24.
- Osguthorpe, R., & Scruggs, T. (1986). Special education students as tutors: a review and analysis. Remedial and Special Education, 7(4), 15-25.
- Pino, C. (1990). Turned on by tutoring. American Educator:

- The Professional Journal of the American Federation of Teachers, 14(4), 35-36.
- Sanjek, R. (Ed.). (1990). Fieldnotes: the makings of anthropology. Ithaca: Cornell University Press.
- Soltis, J. (1993). Forward. In W. E. Doll, Jr., A Post-Modern Perspective on Curriculum (p. xi). New York: Teachers College Press.
- Strauss, A., & Corbin, J. (1990). Basics of Qualitative Research. Newbury Park, CA: Sage.
- Strommen, E., & Lincoln, B. (1992). Constructivism, technology, and the future of classroom learning. Education and Urban Society, 24(4), 466-476.
- Taylor, C. (1976). Transforming schools: a social perspective. New York: St. Martin's Press.
- Warger, C. (1991). Peer tutoring; When working together is better than working alone. (Contract No: RI88062007) Reston, VA: ERIC Clearinghouse on Handicapped and Gifted Children. (ERIC Document Reproduction Service No. ED 345 459)
- Webb, M. (1987). Peer helping relationships in urban schools. (Report No. ERIC/CUE-D-37). New York, NY: ERIC Clearinghouse on Urban Education. (ERIC Document Reproduction Service No. ED 289 948)
- Weinberg, C. (1971). Education and social problems. New York: The Free Press.

Wolcott, H. (1990). Writing up qualitative research.

London: A Sage University Paper.

Yin, R., (1989). Case study research: design and methods.

Newbury Park: Sage.