CURRICULUM IMPLEMENTATION:

A CASE STUDY OF

MATHLAND

By

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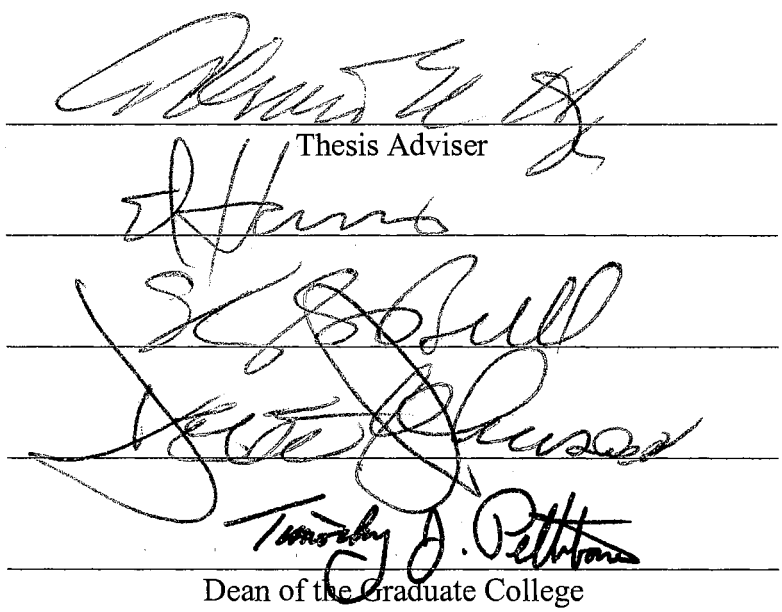

Thesis Adviser

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DEDICATION

For My Father, Harold J.

Dad, you were my first and biggest hero. Even after I had grown,
I still looked up to you. Your courage has given me the courage and
determination to do my best. Not a day goes by that I do not think of you.
I wish that you were here to share this special time ...

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CHAPTER I

OVERVIEW OF THE STUDY

> *After nearly ten years of zealous 'reform,' students are still sitting in pretty much the same classrooms with the same teachers, divided into the same instructional groups, doing the same activities, working through the same textbooks and worksheets, and getting pretty much the same score on many new standardized tests that are the only tangible legacy of a decade's exhortation. (Zemelman, Daniels & Hyde, 1998, p. 3)*

Modern brain research and extensive studies on active learning, engaged learning, and student-focused activities have converted educators toward student-focused activities and the use of manipulatives for the purposes of instruction. The knowledge base behind the new curricula is extensive. In his article, *How new science curriculums reflect brain research*, Lowery (1998) states that:

> New knowledge gained from reading is actually a rearrangement of prior knowledge into new connections. The new curricula provide good examples of how to enable learners to construct their own ideas through an exploration of relationships between materials (objects and ideas) and through the use of reinforcement of prior knowledge. (p. 27-28)

In 1996, MathLand was introduced in the pre-implementation phase of the Department of Defense system-wide adoption as a revolutionary new math curriculum.

Pre-implementation is the point at which new curricula are introduced into Department of Defense Schools. During this phase, parental input and approval may be encouraged and information about the new program will be given. It was stated that this curriculum would improve math teaching using new techniques based on modern brain research and learning. The implementation failed and by January 2000, this program was replaced with a more traditional math program.

Administrators at many levels, and the teachers in the schools mounted a valiant defense of the MathLand curriculum. Classroom teachers, who were trained, believed in the validity of the curriculum. Filling plastic jars with small rubber balls and manipulating millions of small plastic squares was replacing the 'basic' way that children learned math. "Clearly, paper and pencil computations cannot continue to dominate the curriculum or there will be insufficient time for children to learn other, more important mathematics they need to know now and in the future" (Loveless, 2000, p. 8).

In a paper, *A tale of two math reforms: the politics of the new math and the NCTM standards* (National Council of Teachers of Mathematics), Loveless (2000) provides a good summary of the battle for control of public school mathematics beginning with the new math developed during the 1960s.

The New Math of the 60s was introduced and soon failed. The need for a new type of math was fueled by technology, the Cold War and the launch of Sputnik. In essence, it was a race to catch up in an area of academics where there was a perceived deficit. Now, barely a generation later, the clarion call for math reform is news again. Speculation that Americans are once again somewhere behind other technologically advanced nations has fueled the winds of change. "US students are not the mathematical

thinkers and problem solvers they should be.....US students fail to demonstrate the depth of knowledge, ability to reason and problem solve, and the skill mastery that are expected of mathematically proficient students" (Goldsmith, 2001, p. 53).

The NCTM coordinated an aggressive agenda of math reforms funded by the National Science Foundation (NSF) in order to pilot large-scale math reform projects. These projects were designed to change the way math was taught from - drill and practice to activities aimed further up the cognitive scale. Almost from their inception, critics challenged these reforms from all quarters. Many became locally mandated and generated heavy resistance. "The spirited debates about the reform of school and undergraduate mathematics have led some proponents and opponents of change to indulge in such angry rhetoric that the controversy has come to be referred to as the 'math wars'" (Schoen, Fey, Hirsch, & Coxford, 1999, p. 445). The frontline casualties of this particular war are the curriculum, the teachers teaching it, and the students denied access to cognitive skills.

Teachers were faced with the dilemma of sticking to the old traditional style or attempting in some cases to implement a program mandated from somewhere above the classroom level and unpopular with the community. The best and most comfortable compromise would be to develop something that would answer both the mandate and their individual classroom needs. The traditional setting was in place in the Department of Defense Dependents Schools (DoDDS) when MathLand was introduced. It would be fair at this point to define the traditional setting as math that was being taught in the traditional style as it was when the "New Math" of the mid-1960s was abandoned. The

traditional style has no appreciable use of manipulatives and is focused on the basics of problem solving, calculation, and homework.

The DODDS system purchased and perused the implementation of the MathLand program even as California and other states were starting to abandon the program. What was the common thread running through these events and what caused DODDS to abandon MathLand shortly after it began? What were the reasons that led to the collapse of a promising math program established under the guidance and advice of the NCTM and the NSF and glowing endorsements from the U. S. Department of Education? There are several possible answers to explore; this study will examine three schools in the Department of Defense Isles School District in search of these answers. These schools have a total population of nearly 2400 pupils, 170 teachers, 7 school administrators and approximately 30 above school administrators (curriculum advisers and support staff of District Superintendent's office).

Why Did the Implementation Fail?

The research suggests that several factors can play a role in the demise of a curriculum. This study will identify several possible causes, but will focus on the issue of grammar. Tyack and Cuban (1995) define grammar as, "Practices such as age-graded classrooms structure schools in a manner analogous to the way grammar organizes meaning in verbal communication...Indeed much of the grammar of schooling has become taken for granted as just the way schools are" (p. 85).

Despite the fact that MathLand was a sound method of making math meaningful to students, it lacked the rigor that parents expected students to get in a "basic" math

course. Teachers were leaning away from the 'basic' "tried and true methods" of math instruction. Gone were the nights of agony with the multiplication tables, and the 75 addition problems that glued the student to the kitchen table from supper to bedtime. Most of the teachers can remember the "New Math" of the 1960s and what a great failure it turned out to be. They remember how hopeless their parents felt when they tried to help them with the homework. Parents of today viewed MathLand with much the same contempt. Parental pressure in this area may be one of the reasons that caused the withdrawal of the curriculum.

Parents expect immediate, positive results in learning. These results look like A's on homework and on the report cards as well as progress in national testing. Parents are not happy with the idea of long-range curriculum outcomes. Their concern is confirmed when results of independent nationalized testing in the area of computation points an accusing finger at the curriculum. Parents rightfully asked, "When will this get better?" The easy answer was: "When we change the curriculum."

Theoretical Structure

There is a clear conflict between research data, which supports the benefits of teaching new curricula and the failure of these curricula to survive implementation in many school districts. For example, Lowery (1998) clearly circumscribes the benefit of using new curricula. "The new curricula provide good examples of how to enable learners to construct their own ideas through an exploration of relationships among materials (objects and ideas) and through the use of reinforcement of prior knowledge" (p. 28).

There is no question about whether the curriculum was good or poor, only that it was rejected out of hand because it did not follow the traditional pattern that parents expect as part of the culture of the school. In a paper prepared for a conference, *Curriculum wars: alternative approaches to reading and mathematics*, Loveless (2000) focused on the probable cause of the problems in introducing new math programs. Loveless revisited the New Math failure of the 60's in his speech to a Harvard University conference:

> Seymour Sarason identifies how the seeds of New Math's later troubles were sewn in the transition from curriculum lab to classroom. Administrators are removed from the culture of classrooms. Although most administrators are former teachers, they are prone to respect the views of university researchers above those of teachers when considering the adoption of innovations. Administrators loved the New Math, and they urged their local boards to jump on the math reform bandwagon. But teachers, students, and parents were not demanding a new mathematics curriculum, and they were not consulted until it came time to implement the program in schools.
>
> Teachers were introduced to the curriculum through evening and summer workshops, but they were rarely given sufficient time to practice teaching with the new materials. And no one asked teachers if they agreed with the new approach, simply that they must learn how to use it. (p. 4)

The act of changing teaching practices and the omission of parents from the pre-implementation process combined to form an uneasy but highly influential political

coalition between parents and teachers, which contributes to the demise of many new curricula (Tyack & Cuban, 1995).

Politics and Policies that Affect Curricular Change

Loveless (1999) paper provides a good summary of the battle for control of public school mathematics beginning with the new math developed during the 1960s. Pressure created by the U.S. and Japanese technology race in the 1980s and 90s doomed Americans to repeat the mistakes of the 1960s. Once again the U.S. found itself losing the world math race and once again, work began on a new way to teach math.
A reason for failure might be the way the reform was adapted to local schools. The interpretation and subsequent practice of the reform may not have agreed with the theoretical model. Loveless (1999) confronts the issue in his book, finding that, "reforms designed from above and handed down to implementors are molded to fit local conditions" (p. 6). Continuing Loveless's thoughts to a logical conclusion, the ultimate decision-makers for the fate of a particular curriculum would be parents and teachers. "Teachers pick and choose reforms," writes Loveless, "separating the ones deserving their energy and enthusiasm from those they will ignore or de-emphasize.... At every level of the educational system, policy from above is digested and recast in terms agreeable to the educator's own objectives and the demands of the local environment" (p. 135).

A closer look at parent groups may help to understand the dynamics of outside forces. Political linkage is vague yet somehow clearly exists between the organizational abstracts of the school, and in particular, the body politic of parent groups who are not

necessarily well informed, but are well organized. These parent groups, formal and informal, have two characteristics.

> First, parents differ by social class, race, and ethnicity in their access to schools and in their effectiveness in dealing with educators. Second, the concerns of involved parents often are narrow and aimed primarily at gaining advantage for their own children. Thus, rather than improving educational opportunities for all families, inviting parental involvement [sic] unthoughtfully may further focus school administrators' attention on those families that already have disproportionately high access to schools. (McGrath & Kuriloff, 1999, p.604)

The results of these politics may contribute to the demise of the curriculum. At this point, rubber ball math may have also stirred the teaching corps into action or inaction. Decisions that classroom teachers made about following the curriculum or choosing not to follow the curriculum forged entirely different political alliances with either parents or administration during the implementation process. "Those schools whose educators disagreed with state policy either ignored the reform or undertook it grudgingly and, in a limited way, waited for it to wither and die" (Rips, 2000, p. 49). The popular support for the core knowledge movement, "...the knowledge literate Americans tend to share" (Hirsch, 1987, p. 146) could have caused the failure of the introduction. There has also been strong support for the back to basics movement since the late 1980s. Teachers were comfortable with the more traditional methods employed in the classroom before the introduction of MathLand.

In an interview with John O'Neil for *Educational Leadership,* March 1999, E. D. Hirsch points out that there is an ongoing conflict between *core knowledge* and

curricular standards. The gulf that exists is created by the intentional vagueness written into the curriculum. E. D. Hirsch alludes to the obscurity by saying:

> To be specific is to be controversial instantly, because when you include something in the curriculum, not only might somebody object to what you include, but also someone else might object to what you exclude. So specificity is politically dangerous for people who are in politically vulnerable situations. But a second reason is that being explicit about content is seen as going against the tradition of local autonomy. Many educators argue that the professional teacher in his or her classroom knows the individual needs of every student in that classroom, which vary quite a bit, and that the circumstances in North Dakota are necessarily different from those in Washington, D.C.. (O'Neil, 1999, p.28)

Another reason for failure may be that too much change is introduced too soon and traditional teaching methods are lost in the innovation of the newly introduced curriculum. The following comparison begins with suspicion about the motives of the school system for making change and challenging instruction, changing the fundamental grammar of the school, and suspicious of the teachers introducing the new curriculum. Finally, support of teachers and parents alike is necessary in order for the change to take place. A comparison of the traditional assumptions to the alternative assumptions follows:

Successful Implementation	Failed Implementation
School systems are always seeking to improve the quality of instruction. The quality of instruction is generally good. Grammar helps to define the elements of the school. Change is planned for and carefully implemented. Teachers accept change as part of the job. Teachers generally support changes that they believe will improve instruction. Parents support teachers as good practitioners, skilled in their craft.	Schools are experimenting with radically new and different methods of teaching. The quality of instruction is suspect. The grammar of the school has radically changed. The school system is experimenting on the students. Most of the teachers do not support the change. The intended changes will die from lack of teacher and parental support during implementation. Parents believe teachers are carrying out these changes without material support and proper training.

Figure 1. General Assumptions about Implementation

In this study, the research focuses on "grammar," an element that transcends the other causes of curriculum failure, teacher opinion and parental approval. Support from both groups is essential to the success of curricular change. The introduction of any radically new curriculum into a school system challenges the grammar of the school. The notion of grammar is summarized in Tyack and Cuban (1995).

> During the last century, there has been much continuity in the structures, rules, and practices that organize the work of instruction. These organizational regularities, the grammar of schooling include such familiar practices as the age-grading of students, the division of knowledge into separate subjects, and the self-contained classroom with one teacher. (pp. 8-9)

The role of grammar in the implementation process was the focus of this study. Tyack and Cuban (1995) identify the key aspects of grammar: "The basic grammar of schooling, like the shape of the classrooms, has remained remarkably stable over the decades. Little has changed in the ways that schools divide time and space, classify students and allocate them to classrooms, splinter knowledge into "subjects," and award grades and "credits" as evidence of learning (Tyack & Cuban, 1995, p. 85).

More importantly, Tyack and Cuban (1995), identify reform in schools as "...intrinsically political in origin. Groups organize and contest with other groups in the politics of education to express their values and secure their interests in the public school" (p.8).

At this juncture, it is important to note that it is the departure from grammar that influenced the course of the implementation process. "Indeed, much of the grammar of schooling has become taken for granted as just the way schools are. It is the *departure* from customary school practice that attracts attention (Tyack & Cuban, 1995, p. 85).

There were changes in the grammar of the traditional mathematics classes. These changes included but were not limited to: the disappearance of regular homework, non-traditional methods of teaching, the absence of a textbook, and a radical change from emphasis on drill and practice and computation skills as well as a greater reliance on the use of manipulatives in lieu of lecture. The differences between traditional teaching

methods and the methods required by the introduction of MathLand brought administrators and teachers under closer scrutiny by parents.

During the process of implementing MathLand, three groups should have merged into a coalition of support for the new initiative. These groups were administrators, teachers, and parents. Rather the groups merged as distinct political forces that may have caused MathLand to fail. Political processes forced the formation of coalitions of these groups.

Purpose of the Study

This study identifies the alliances of these forces and the impact that they had on the implementation process and endeavor to demonstrate that there is a tremendous link between grammar and the "evidence of learning" identified by Tyack and Cuban (1995). The purpose of this research was to discover the role, or the extent of the role, of grammar in the success or failure of curriculum initiatives. If grammar was not a factor, or only a partial factor, in the failure of MathLand, then this study will attempt to uncover which forces did cause the change to fail. If the argument for grammar is true, then consideration of this issue must be taken into account when making radically different changes in schools.

Objectives of the Study

Objective Number 1

To examine through a research based lens, the dynamics, and politics that develop between administrators, teachers and parents when new curricula are introduced.

- What are the perspectives of the players most actively involved in the implementation of a nontraditional curriculum?
- Are these perspectives consistent with the research, and were the results of the reaction to the implementation predictable?
- In what ways does the grammar of the real school and of mathematics in particular inhibit or support the introduction of nontraditional curriculum and instruction within the institution?

Objective Number 2

To describe the activities of each group and assess the impact that they had on the implementation process.

- In what ways were the activities of the administrators consistent with the plan for successful implementation of the curriculum?
- In what ways were the activities of the teachers involved consistent with the implementation plan?
- In what ways were the activities of the parents involved consistent with the implementation plan?
- Were parents involved in any aspect of the pre-implementation process?
- What parent activities influence the process of implementation?
- How did parent activities influence the implementation process?

Objective Number 3

To examine the activities of forces within and outside of the school that led to the establishment of alliances that affected the implementation process.

- What were the pressures placed on local administrators during the implementation process?
- What were the actual pressures placed on teachers during the implementation process?
- What were the perceived pressures felt by the classroom teachers during the implementation process?

- What negative alliances formed between any of the groups during the implementation process?
- Which groups formed the alliances?

Players in the Study

There is a triad of variables in this study which undergo a complex metamorphosis as the curriculum moves from the planning stage to the implementation stage and finally to the withdrawal of the curriculum or the introduction of negotiated changes which will make the new program more palatable. The triad includes administrators, teachers and parents. The interaction of these groups rely heavily upon the perception of each group that the other group or groups are actively engaged in forming alliances or making substantial changes in the status quo.

Administrators reacted differently to internal pressures from teachers and external pressure from parents. How administrators respond to internal pressure is influenced by variables such as, years of experience as an educator, years of experience in their present position, and how both parents and teachers view them as the educational leaders. Powerful leadership in an administrative position coupled with the weight of its prestige can considerably reduce the impact and influence of the other groups. "The leadership, provided by a mathematics coordinator, principal or teacher with an excellent reputation in the school district was the primary social influence on the participating teachers" (Manouchehri & Goodman, 1998, p.34).

Administrators must also be trained to recognize changes in teaching styles brought on by the introduction of new curriculum. This encourages teachers to try new

methods and promote comfort and creativity by encouraging them to explore new teaching techniques. Research indicates that this is not always the case,

> They (administrators) must be able to determine the extent to which standards-based programs are being implemented in their building and be able to assess their site-specific needs. A teacher attempting to implement standards-based instruction is demoralized when a principal, observing a lesson in which the teacher is facilitating small-group work, says, "I'll come back to observe you when you're teaching." (Briars, 1999, p. 25)

Teachers must oblige mandates from above the classroom level, but can still have a major influence on the presentation of the curriculum as a package. In their article, Adams, Clayton, Rakotomanana & Wang (1997) used the word "institutionalization" to describe sustained changes made at the classroom level. It has been called "a process throughout which an organization assimilates an innovation into its structure... a stabilized modification, aiming at improvement of an institution or parts of its processes, products or capabilities." The article goes on to say that, "Teachers as the group closest to the action could be also expected to see most clearly the weaknesses in the new practice" (Adams, et al., 1997, p. 10).

More importantly, differences in skill levels, teacher training, and knowledge will tend to drive wedges into the fabric of the curriculum itself. In an article, Manouchehri and Goodman (1998) found that

> ... in schools where the teachers were surrounded by colleagues and peers who were skeptical about the standards-based curricula as well as about the practicality of classroom practice materials, the teachers

were less inclined to use the programs...even the teachers with constructivist perspectives on teaching and learning reverted to a traditional routine of classroom instruction. (p. 34)

This finding clearly indicates the strength of peer influence within the institution itself. So strong is the influence that it reaches into the confines of the classroom itself and alters not only the methods and practices of teachers; it also alters their personal styles and paradigms.

For the parents, research revealed that communication by proactive teachers and administrators is paramount to the success of curriculum implementation.
In an article written about mathematics reform in Pittsburgh Schools, Briars (1999), points to four key components in communication with parents that help to pave the way for successful adoption of curriculum:

1. Make basic skills visible to parents.
2. Provide specific information about how parents can help their children.
3. Provide information on assessment as well as curriculum and instruction.
4. Listen to parents. (Briars, 1999, p. 27-28)

Many teachers prefer to operate well within the expectations of parents. In interviews with teachers (Manouchehri & Goodman ,1998), these expectations were brought to the forefront.

I tried to tell them (parents), about the National Council of Teachers of Mathemtics (NCTM) recommendations and that we wanted kids to do different

> things than before (pause) they just did not want to hear of it... I am going to go back and use the old textbook too. So the kids can take home something parents had seen before. (p. 35)

"One reason that changing grammar is difficult is that reforms in one classroom or mini-school or school or district take place within a larger interdependent system" (Tyack & Cuban, 1995, p.109). Aspects of this wider system must be taken into account when the implementation process begins. Teachers must begin to enlist public support for the change in grammar. Teachers play an important role in the public relations blitz that should precede the introduction of new curricula. "Conversations with parents revealed that they felt most secure when the teachers were articulate and confident about their own practice and about the mathematical value of what they taught in their classes" (Manouchehri & Goodman 1998, p. 35). The discourse and interactions between teachers and parents can alter the process of implementation. Parental needs and concerns expressed when they are unable to assist students with their homework or when they see nontraditional homework being sent home are directed at the perceived source of the problem, the classroom teacher. In her article in the National Association of Secondary Schools Principals (NASSP) bulletin, Goldsmith (2001) outlines the difficulties faced by parents during math implementation.

> Parents and guardians most often bring two concerns about new curriculum approaches to principals and mathematics departments. First, because the mathematics their children are studying looks so dissimilar from what they remember learning, parents may worry about whether their children are learning the right kind of mathematics. Second, parents are often uncertain about how to

help their children with their homework. There are a variety of ways that principals can help involve parents in their children's mathematics learning. (pp. 60-61)

Procedures

Data from this study was collected from the Isles District Schools, which is part of the Department of Defense Dependents School system. Members of these communities represent a fair cross-section of an average small town in the United States. However there are some major differences. There is tremendous fiscal support given to families in terms of housing and working conditions. Families are provided with free medical and dental care and tax-free status while shopping on the bases. There is no unemployment. Parents are free to home-school or send their children to local national schools. Families do suffer stress when family members are posted to other parts of the world, on a moment's notice and in some cases for an indefinite period of time.

Data Needs

Three sources of data were collected from people who were involved in the implementation process in and outside of the school system. This information was collected through the process of formal interviews with administrators responsible for the implementation of the MathLand program. Data will be collected in order to document the activities that administrators were involved in during the implementation process.

The second group that was interviewed were the classroom teachers. The activities and classroom adjustments that they tried during implementation are of

paramount importance. The pressures that teachers felt, either real or perceived, was an important dimension when considering the overall implementation picture.

The third group was the parents of the students involved in the MathLand program. The activities that they were involved in at the school level, particularly with teachers and administrators as well as administrators above the school level may provide clues to the alliance-forming behaviors with other groups.

Data Collection Methods

The data collected was through direct interviews with administrators, teachers, and parents of students involved in the MathLand program. The questions were designed to reduce bias by the interviewer. Some questions were directly aimed at the biases of the respondents. No questions were directed at the quality or appropriateness of the curriculum itself. Each set of questions will focus on the issues pertinent to each group of respondents.

The Interview

To aid in the interview, a bank of five questions were developed and tested in a pilot interview with members of each of the data groups identified in the variable section. A final selection of interview questions was developed after the pilot interviews are conducted and studied, and permission is given to conduct interviews by the Internal Review Board and approval by DoDEA authorities.

Population

The population selected for this study were members of the faculty and staff of the Lakenheath and Feltwell DoD schools. The sample included administrators, curriculum specialists, as well as building principals and assistant principals involved in the implementation process. The sample will also be composed of between ten and fifteen elementary and middle school teachers.

Data Analysis

Raw data was transcribed verbatim into document form for analysis and interpretation. The data was analyzed against the grounded theory using "Category Construction" as outlined in *Qualitative research and case study applications in education* (Merriam, 1998, p.179). The interviews were taped and transcribed verbatim and then processed through using the ethnographic approach as defined by Merriam (1998), "...an ethnographic study focuses on the culture and social regularities of everyday life"(p. 156). Coding and data analysis was accomplished using the category construction method Merriam (1998). "Categories and subcategories (or properties) are commonly constructed through the constant comparative method of data analysis." (p. 179)

Significance of the Study

Discovery of the interactions of classroom teachers, administrators, and parents will contribute to an understanding of the dynamics of the politics and implementation of new curricula into school systems. The evidence in this study will support the theory that

there are a series of activities that can be used to support the introduction of new curricula.

This study will help to reduce the interpersonal stress by all members of both the schools and the communities that they serve caused by the changes introduced along with new curricula. Educational institutions that are introducing new curricula will save time and money. Staff developers and curriculum designers will benefit from the practical use of the data and information gathered in this study. Staff development will be able to use the study as a precision instrument to help design workshops, which will support new curricula.

Summary

There are critical elements that are needed in the introduction of any curriculum. Long and painstakingly detailed meetings with parents and other community members were held in the schools at the start of the school year, by contrast when time came for the re-implementation of traditional curricula a single meeting of less than one hour was held to announce the change. Many of the elements of a traditional math pregram are implicit in the 'grammar' of the school as an institution. Omission of some of the elements will not have much of an effect on successful re-implementation of traditional math curricula.

Nontraditional curricula must overcome the novelty of the new and different as well as a challenge to the grammar of the school. Perhaps elements that are left out of the grammar of the new curriculum begin a cascade of events that bring about the demise of the new curriculum.

Reporting

Chapter II contains a review of the pertinent literature germane to the study. Chapter III presents the data collected. Chapter IV analyzes and interprets the data collected during the study. Chapter V summarizes the study, draws conclusions, states recommendations, and implications for further study.

CHAPTER II

REVIEW OF THE LITERATURE

Since the failure of new math in the early 1960s there has been a huge volume of research on curriculum implementation. Researchers have recommended detailed and very specific protocols to help ease the difficulty in introducing curricula that are radically different from the curriculum being taught. Researchers make various recommendations pointing toward a silver bullet, which will help to make a seamless transition from the curriculum that is currently being taught to the new curriculum that is being implemented (National Council of Teachers of Mathematics 1989; Ramsay, Harold, Hawk, Poskitt, Marriott, & Strachan, 1992; Reys, 2001).

Changing a curriculum changes the culture of an institution by changing the language that is part of the institution's identity (Peterson & Deal, 2002). A change in the language that is used to identify any institution is really a change in the grammar of that institution—an identity change. The change in grammar must be accompanied by new terms to enable individuals to accept that change and use the new grammar to identify the institution. Failure to identify the grammar changes in radically new curricula is one of the factors that lead to the rejection of the new curriculum. This change in grammar influences the interplay among and between the actors involved with the institution specifically; parents teachers, and administrators. Conflicting interests of these groups

are compounded by new grammar, or no grammar, changes in the politics and interactions of these groups. These interactions lead to the demise of many promising curricula. When institutions make plans to change curricula, the issue of grammar cannot be neglected. The purpose of this review is to explore literature that is salient to or in contention with this position.

Neither the grammar of schooling nor the grammar of speech needs to be consciously understood to operate smoothly. Indeed, much of the grammar of schooling has become taken for granted as just the way schools are. It is the *departure* from customary school practice that attracts attention. (Tyack & Cuban, 1995, p. 85) "Grammar in this sense might be thought of as both descriptive (the way things are) and prescriptive (the way things ought to be)" (Tyack & Cuban, 1995, p. 165).

Why Do We Change Curricula?

Research indicates that change in curricula in all academic areas is inevitable. Technology and societal pressures (Rips, 2000; Sarason, 1996) drive change. In recent years, changes made in the math curricula of many school systems have been justified by saying that the changes in the way math is taught clarifies and improves the way that mathematics is learned (Manouchehri & Goodman ,1998; Zemelman, Danials & Hyde, 1998).

In a commentary article for *Education Week on the Web,* Goldman (1997) alludes to the cause of the latest math reforms. The most recent change to the way Americans teach and learn math was prompted by the 8th grade results in the TIMSS (The Third International Mathematics and Science Study) in 1996. More than 40 nations

participated in the test, and American 8th graders ranked 28th. This result was well below the average for the test. The recommendation from TIMMS was: "U.S. students need to work toward a better deeper understanding of mathematics—the "how" and "why" behind the equations" (p. 2). The focus was toward technology and away from core teaching... well past the traditional core. A teaching corps that was already calling for more training would attempt this massive set of changes. Teachers were already well beyond the limits of their training. (Goldman, 1997, p. 2)

Teachers were expected to teach standards-based mathematics in a familiar and comfortable style. The changes made in styles of teaching reach into the very core of the subject that they touch. Any proposed change—be it the new math, the new physics, busing, decentralization, etc—affects and will be affected by all of these types of social relationships, (professionals within the school setting, professionals and students, professionals and society) and this is precisely what is neither stated nor faced in the modal process of change in the school culture. (Sarason, 1996, p.59) Differences are not merely philosophical or skills related they represent a major paradigm shift. The conservative, "back to basics" movement embedded in a pedagogy of "core knowledge"(Hirsch, 1987), was challenged by scientific findings and research based methodology for teaching mathematics. The term "basic" is used in the literature of several authors but almost no one clearly defined the term for mathematics. Loveless (1997) identified the components of basic math saying

> Until recently, the math curriculum from kindergarten through 8th grade focused on basic skills: in particular, learning how to use four forms of number (integer, fractions, decimals, and percents) in performing four operations (addition,

> subtraction, multiplication, and division). Students who mastered the 16 manipulations embedded in this knowledge, including when and how to employ them in solving problems, were in good shape to move on to higher math. (p.2)

The clash between these antithetical paradigms was ended for a time by the recommendations published by the National Council of Teachers of Mathematics (NCTM) in 1989. "Reform recommendations in this and related documents deal with how mathematics is taught, what mathematics is taught, and, at a very fundamental level, the very nature of school mathematics" (Battista, 1999, p. 426).

Battle lines were drawn between those who wanted to maintain the conservative approach to math by teaching math that was rich in fundamentals, basic math, and drill and practice. This approach was contrasted by the liberal, modern approach to math using deductive skills and a more constructivist model awash with cooperative group learning, journal writing, and manipulatives. Strong opposition to change was offered by the traditionalists. Heated debates took place to decide which methods were scientifically and academically sound. Recent brain research touted the constructivist approach while mountains of data bolstered by nationalized testing results supported the traditional, back to basics approach. Both sides hoped to establish an educational direction to be traveled if only for a little while. "What seemed to be an overwhelming national consensus on directions for change in mathematics education is now facing passionate resistance from some dissenting mathematicians, teachers and other citizens"(Schoen, Fey, Hirsch & Coxford, 1999, p. 445).

Our conception is not only a matter of formal thinking, rigorous observation, and rational investigation, but largely a derivative of countless experiences that define for us

what is right, natural and, proper. This is of no consequence, as long as schools are perceived as congruent with our perceptions. (Sarason, 1996, p. 28)

Change and Culture

"Culture refers to norms of behavior and shared values among a group of people" (Kotter, 1996, p.148). Institutions are described as "cultural accounts" (Meyer, Boli & Thomas, 1994, p. 25). Research has shown that institutions and organizations have a culture, which is unique to the institution (Law & Glover, 2000; Mertz, 1990; Meyer & Rowan, 1977; Nespor, 1997; Sarason, 1996). "Institutions are descriptions of reality, explanations of what is and what is not, what can be and what cannot. They are accounts of how the world works, and they make it possible to find order in a world that is disorderly"(Meyer, Boli, & Thomas, 1994, p. 25). Therefore, changing a math curriculum constitutes an assault on the existing culture. Changing what is done in the classroom culture also means moving teachers from their comfort zones in terms of teaching within their respective subject areas; it means introducing new methods and changing the language of what is taught. This change is also linked to a change in the institution's grammar.

> Culture covers both the working and cultural processes in organizational settings and the emergence of specific cultural forms and practices which may or may not be expressive outputs of the former. What is necessary here is closer attention to the underlying nature of the symbolic process, and the way it connects individual understanding, identity, and subjectivity to wider power relations through language. (Linstead, 1999, p. 20)

> The new math was introduced into schools without taking into account their structural and cultural characteristics, and without any discernable theory of how change was to be effected and the criteria by which its effects were to be evaluated—and we shall not dignify change by reason of faith, and administrative fiat as constituting a theory of change. (Sarason, 1996, p.33)

Sarason is referring to the introduction of the New Math of the early 1960s not the MathLand program rejected in California in 1996 and in the Department of Defense Dependents Schools (DoDDS) in January 2000 but the connections to a change in the institutional grammar transcends four decades.

Established institutional forms come to be understood by educators, students and the public as necessary features of a "real school" (Metz, 1990). They become fixed in place by everyday custom in schools and by outside forces. They become both legal mandates and cultural beliefs. They become so much a part of the institutional genera that they are barely noticed. They become just the way schools are (Tyack & Cuban, 1995). Culture has as its foundation a "grammar" (Tyack & Cuban, 1995). This grammar is organized and defined and becomes integrated into the culture of the institution.

Cultures, including a language, are essential components that help us to identify institutions. Social patterns of behavior are established between people in these institutions and help to organize complex duties into more refined and disciplined tasks (Tyack & Cuban, 1995).

Change and Concern

"Ironically, the only time that Americans pay any attention to mathematics teaching is when educators attempt to change it" (Battista, 1999, p. 426). NCTM used modern brain research and the radically different approach to teaching mathematics promoted by Jerome Bruner and a host of other reformers. American students were unable to attain proficiency in mathematical mastery in almost all areas of math (Dossey, Mullis & Jones, 1993; Goldsmith, 2001; Schmidt, McKnight & Raizen, 1997; Silver, 1998).

Changes in technology over the past four decades have led to thinking about change in the way that math was taught in the classrooms across the country. Specifically, these changes would include use of calculators and computers, problem solving using probability statistics and solving concrete problems in real life contexts, and finally, students being able to communicate or explain their reasoning for the solution to the problem (Battista, 1999; Schoen, Fey, Hirsch & Coxford, 1999). The call for change did not require teachers to discard all of the tools that they were using to teach math. Proponents did not downplay the importance of a curriculum focused on basic skills. However, proponents did suggest that teaching should focus on the basic skills needed for today's world, not the basic skills of forty years ago. Helping students to find the correct answer was no longer the main problem for mathematics teachers; the new problem was getting students to decide what to do with it (Battista, 1999, p. 428). This was a change from pencil and paper calculation, from a focus on arithmetic and algebraic solutions to problems; it was a change in the language of mathematics—a change in the grammar of math.

> One of the greatest obstacles to efforts to improve schools is parental nostalgia for schools as they used to be. When school reforms seem obscure to parents who are already anxious about their children's future, they often cling to the comfortable recollections of "real classrooms" and "real schools" that are familiar to them from when they were children. (Hargreaves, 2001, p.375)

When dealing with the novelty of new programs like changes in curriculum, or changes in school programs in general, parents have a tendency to revert to this nostalgia. Nostalgia is a fallback to the familiar that leads to a head on collision with change (Goldsmith, 2001; Hargreaves, 2001; Lasch, 1991; Tyack & Tobin, 1994). Nostalgia occurs when parents, mothers in particular, compare their children's education to their own (Brantlinger & Majd-Jabbari, 1998). This nostalgia also includes terminology and language common to the nostalgia episode.

Parents and Curriculum Change

Parents disagree with the view that there is not much that they can do to change the educational situation in their community. They see themselves as instrumental in helping their children in the learning process by supporting their children at home with homework, and understanding better how their children learn (Haney, 1977).

Case studies suggest that parental opposition to changes in schools is treated as a technical problem, a political problem, or the result of organizational practices that fail to involve parents or the community adequately in the change process. Success in change also requires monitoring parental concerns (Gold & Miles, 1981; Smith & Keith, 1971;

Nespor, 1997). The influence of parental pressure on curriculum choice was also underestimated in the 60s with the introduction of "New Math."

> We have been down this road before. In the 1960s, the curriculum known as "New Math" was routed from the classrooms by angry parents and teachers. Parents didn't recognize the mathematics that children were bringing home from school, and teachers found it almost impossible to instruct students on the strange new topics recommended by reformers. (Loveless, 1997, p.1)

Parents are at the root of the "innumeracy "(Battista, 1999, p. 426) pandemic. Adults are more open about their ineptitude with math than they are about being able to read (Battista, 1999). Conservative, 'basic skills' mathematics are called for, even in the face of overwhelming evidence that suggests a radical change in teaching methods is mandated (NCTM, 1989). The call for change was not addressed in schools because there was little incentive for the change to take place. For many parents, their student's mathematical ineptitude was acceptable, as long as they were inept in traditional math (Battista, 1999).

One of the considerations ignored by the introduction of math reforms in the late 90s was the reaction of conservative detractors and the potential for parental involvement in first stalling and finally reversing the math reform change process across the United States. The most controversial reform was written by *Creative Publications* and was called *MathLand* (Loveless, 2000). Unlike the "New Math" of the 1960s, new technology, specifically the Internet, was employed to spread the message of concern. Hundreds of concerned parent groups formed Internet open forums across the nation with astounding speed and energy. Parents were now able to establish a huge network of like

thinking and mutually concerned parents with whom to share their ideas about math reform. A new website, *Mathematically Correct* was established by parents and for parents specifically for the assault on math reform. This site enlisted the support of parents in opposition to math reforms and urged support to reverse the change process. The Internet assault joined forces with major newspaper containing articles written by professors of mathematics and teachers in from around the country to oppose and finally reverse mathematics reform. Viadero (1999) found that

> David Klein, a professor of mathematics at California State University and one of five co-authors of a letter challenging the validity of the new math programs were joined by 192 scholars and educators with impressive credentials. These authors took out a full-page ad in *The Washington Post* in November 1999 condemning 10 mathematics programs that were declared "exemplary" by the Department of Education. (p.1)

The collateral damage created by the anti-reform forces, was not limited to math reform in America, but also leaked into Department of Defense Schools around the world. As parents relocated to overseas schools from bases in the United States their concerns about reformed mathematics instruction and in particular the MathLand program were brought along as well. Members of the military community, particularly those formally stationed in California, were extremely suspicious and in many cases voiced strong opposition to the MathLand program. MathLand had just been introduced in 1996 and was in the process of being implemented in the Department of Defense school system. Despite the ringing endorsements from the Department of Education and the Department of Defense Educational Activity touting MathLand as a "promising"

program (Loveless, 2000), parental objections still surfaced. An example of parental concern about the MathLand program was written in the Letters to the Editor section of the *Stars and Stripes* on July 31, 1997. It condemned this type of standards-based reform and issued a plea for a more back to basics approach.

> According to DoDEA, nearly all parents and faculty want DoDEA schools to strengthen their role in teaching students academic skills. According to a 1994 Public Agenda poll 96% of Americans want tougher and more challenging courses in the basics. And what do we get? MathLand. (McArthur, 1997, p. 39)

Involving parents in the change process is vital, if the change is to be successful.

Parents want to be involved as equal partners in the change process and what is more important seek ownership in that process (Ramsay, Harold, Hawk, Poskitt, Marriott, & Strachan, 1992). It should be noted at this point that true parental involvement in schools is seldom without motive (McGrath & Kurloff, 1999; Holden, Hughs, & Desforges, 1996; Rips, 2000).

There was a growing body of evidence to support the idea that there were no short cuts to mastery when it came to success in mathematics. Parents who held those beliefs would rebel when progressive practices were introduced. Concerned parents fought hard to be heard by the NCTM board and they are now deciding the fate of future NCTM standards (Loveless, 2000). Parents are more aggressive about voicing concern in curricular change. They often will enlist the assistance of administrators when putting pressure on individual classroom teachers (Manouchehri & Goodman, 1998).

In Department of Defense schools, many School Improvement Plans (SIP's) called for more and more community involvement. One Isles district school also included math

improvement as part of the SIP: "Improve student achievement in math with an emphasis on application of math skills to real life situations or problem solving"(Oak Hill Elementary School Parent Handbook, 1996). Additionally, Department of Defense schools established Parent Advisory Committees (PAC's) and held Town Hall meetings and other forms of open forums for parents to share concerns. These forums provided a venue for parents to share concerns but they did not offer the parents a means of changing established practice. Little was offered to parents in terms of curriculum changes or parental input on curriculum selections at these meetings. Parents were undeterred by the lack of input into the adoption process; many used open forums such as the website called *MathLand and Connected Math Articles* in order to share their views. The following is an excerpt written on the site by a parent of a Department of Defense School student on October 30, 1996:

> Parents have been advised by the curriculum czars in Washington D.C. that we must wait three years to see results. We all feel our children are guinea pigs in a bad experiment. I don't know if DOD would launch a weapon system so untested!!! Additionally, we have been told to rest assured the rest of the country is headed this way and everyone fully supports the NCTM pedagogy..... Parents who are transferring overseas should bring appropriate materials to supplement their children. People who came over unaware of the current problems are contacting family and friends for texts and other materials. There are a few tutors available but it depends on your location.

> Unlike stateside schools, we do not have an elected school board that we can vote out. Our schools are run out of Washington D.C. Those of you living in local communities should treasure your vote and vote wisely. (Anonymous, 1996, p. 1)

Studies indicate that teachers anticipate a parental resistance to change and consider it a barrier to the success of the change. Teacher anxiety is not unfounded. In February 2000, there was a congressional hearing into standards-based math programs. Parent testimony was aggressive and opposed to that style of teaching Reys (2001) found that

> In arguing against the use of Standards-based curricula, a speaker alleged that children were being used as guinea pigs for untried curricula. This argument has strong emotional appeal. What parents want their child to be used as a guinea pig? One parent testifying at the congressional hearing advocated "stricter controls to prevent schools from using untested programs without the informed consent of parents and students. The claim or even suggestion that the NSF (National Science Foundation) curricula are untested is bogus. (Reys, 2001, p.7)

One of the primary issues with parents is the ability to assist students with their schoolwork at home. Parents in primary grades see involvement in the homework process early and often as one of the keys to student success.

> Most parents, especially of elementary students, want to help their children learn math. Unfortunately, traditional ways of helping (e.g., showing them how to do specific procedures) are not applicable to standards-based programs. Many reform programs are activity-based. Students keep journals instead of using traditional textbooks. Thus parents do not have access to the regular, specific information about what is going on in class that they got from textbooks. Even if

> books do come home, their content often is so different from parents' experiences that most are at a loss about how to help their children. (Briars, 1999, p.28)

The resistance to change is reinforced by parents' inability to assist students with homework. Much of the frustration about homework was due to the lack of textbook information supporting classroom activities as well as support materials that would allow parents to assist a student in successfully completing a homework assignment. Parents asked teachers to assign a more traditional type of homework assignment. These traditional homework assignments increased homework success, but they undermined the success of the curriculum. Conversely, parents were supportive of innovative approaches to mathematics when they were educated about the changes early in the change process.

> If we want parents and the public to accept and value standards-based assessments, we must inform them about the topic. Pittsburgh's director of public relations created a successful way to provide such information. During "Take the Test Night," parents answered sample questions from our state and district tests, including the New Standards Reference Exam, had dinner, then scored their own tests and discussed the results. Parents were surprised at the level of questions on the NSRE and clearly recognized it as a good test of their children's knowledge. (Briars, 1999, p.28)

The rise in an accountability-focused quasi-market in education (Le Grand & Bartlett, 1993) and the accentuation of parents as 'active choosers' of educational provision (Echols, Macpherson & Williams, 1990), have increased the success of programs in schools by closer scrutiny of both teachers and classroom practices by parents (Law & Glover, 2000). Classroom visits by parents have changed face. Parents

are now more motivated to visit classes by interest in individual classroom activities, teaching practices, or when they are suspicious of curriculum. Parents were more comfortable with teachers who were secure and confident about their ability to teach in a nontraditional style (Manouchehri & Goodmann, 1998).

Some teachers included a parent letter about the MathLand program in the support materials sent home with students at the start of the year. This letter was included in the deluge of paperwork that comes home with the student at the start of the year, so no special attention may have been given to the letter by parents. The letter indicated that there would be a change in the way in which math would be taught and gave some general information about the MathLand program. There was little in the letter that would give cause for alarm. It indicated that worksheets would not be sent home and that "basic computation skills will still be learned in class". The word 'homework' is used to identify a "student letter" that would be sent home each week. It is suggested in the letter that the student do the activity in the student letter (Charles, Brummett, McDonald, & Westley, 1995). No mention of a textbook or lack of a textbook is given. This represented another error in the grammar of mathematics for classrooms using the MathLand program. Loveless (1997) identifies the importance of a textbook to curriculum saying

> Texts publicly declare the curriculum. They link home and school, and by providing a calendar for learning, allow parent, teacher, and child to see what has been covered and what lies ahead. The textbook is the closest thing we have to an enforceable learning contract in an American school, and for the last century, no serious academic subject has been taught without one. (Loveless, 1997, p.3)

MathLand was taught without a textbook. In fact, no books were provided until the supplemental materials were distributed in January 2000. (A copy of the letter is included as Appendix E)

Teachers and Change in Curriculum

There are two significant parts to teaching that must be addressed; one is the science of teaching; the other is the art of teaching. Teachers learn the science of teaching in methods courses that are taught during teacher training. The art of teaching is developed and completed in their classrooms over of a period of time. It is the intelligent use of resources and one's scientific knowledge that raises teaching to an art form (Stout, 1999). Both the science and the art of teaching are required to impose successful change.

The issue of change in teaching and teaching methods is not new. John Dewey, in 1929, called for teacher preparation to stand ready for change. "Command of scientific methods and systemized subject matter liberates individuals; it enables them to see new problems, devise new procedures, and in general makes for diversification rather than for set uniformity" (Dewey, 1929, p.12). But Dewey is calling for proficiency in subject matter, stating that this clearly makes one ready for change. There is more to successful teaching than knowledge of subject matter.

> Teaching for problem solving, invention, and application of knowledge requires teachers with a deep and flexible knowledge of subject matter who understand how to organize a productive learning process for students who start with different levels and kinds of prior knowledge, assess how and what students are

learning, and adapt instruction to different approaches. (Darling-Hammond, 2000, pp.166-67)

The change to MathLand was a change toward the constructivist approach to teaching mathematics.

> For the brain to construct knowledge and behaviors, it must take in data that it can use for the construction. The only way the brain takes in data is through sensory perceptions that enter through the windows of the body's five senses. (Lowery, 1998, p. 26)

Constructivist teachers trust that all children can reinvent math. Constructivists also believe that no matter how "disadvantaged" students may be, teachers can tap into the knowledge pool. A student brings this pool of knowledge into the classroom and under the right conditions constructivism can be fostered. These conditions are known as Developmentally Appropriate Practice (DAP) (Bredekamp & Copple, 1996). The student can bring meaning to what is learned by sharing it with others, creating their own hypotheses, and having their errors understood by collaborating with others (Zemelman et.al, 1998). Constructivism downplays the role of the teacher from imparting new knowledge to the learner to one where the teacher serves as a guide and mentor to the learner (Goldstein, 1998; Loveless 2000; Lowery 1998; Stout, 1999).

The difference in the teacher's role in the classroom represents a fundamental change in the way that teachers were taught to teach, and what is more significant, a change in the way that they are expected to teach. This represents a change in the grammar used to define the role of the teacher. In a study done in Portland, Oregon in 1970, educators tried a radically new approach to education by establishing a team-taught

educational program using an interdisciplinary general education program. A summary of the study indicates that teachers experienced significant parental pressure by having a local parent group formed because of the departure from a proper school. Teachers also experienced fundamental changes to the grammar of teaching (Tyack & Cuban, 1995).

There is a gap in knowledge that exists between the emerging research-based teaching methods being recommended for classroom use and methods courses taught to the current teaching corps. Many teachers need time, support, and practice to deepen their content knowledge and develop new instructional approaches (Fennema & Nelson, 1997; Fullan, 1991; Schifter & Fosnot 1993; Supovitz, Mayer & Kahle, 2000; Thompson and Zeuli 1999).

Teacher retraining in new methodology and skills generally takes the form of a two-week summer workshop. The retraining is accomplished using the same techniques that the workshop is trying to change. Further, it is believed by the workshop organizers that the short summer workshop and additional support over the following teaching year will be enough to change the way that a teacher practices their craft and will assure the success of a new curriculum (Sarason, 1996).

Acquiring new skills is not enough, true change will occur when teachers think differently about math (Loveless, 2000). Knowledge of methods in general, to include learning and teaching methods, influence performance and in some cases are equal to or exceed subject matter knowledge (Ashton & Crocker, 1986; Begle & Geeslin, 1972; Byrne,1983; Evertson, Hawley & Zlotnick ,1985) "It seems logical that the pedagogical skill would interact with subject matter knowledge to bolster or undermine teacher performance" (Darling-Hammond, 2000, p. 167). This lack of confidence in teaching,

whether in subject matter or in the methodology of teaching methods, influences parent actions in terms of accepting change (Manouchehri & Goodmann, 1998).

Change in any form puts teachers in the position of being asked to make significant changes in their daily routines and practices without compensatory time or the resources to accomplish the task. A number of choices must be made to accommodate the change: comply symbolically, ignore the changes in the seclusion of their classrooms, or hybridize them (Tyack & Cuban, 1995). None of these choices deal with the teacher's knowledge of his or her subject area; the real issue is a change in the pedagogy of teaching and for some teachers a massive paradigm shift.

In her study of curricular change in the Pittsburgh School System (Briars, 1999) learned some hard lessons about instituting mathematics reform into a school system. Briars said that teachers play a pivotal role in the success of curricular change. Teachers must clear up the confusion between standards-based math (basic skills math) and standards-based instruction (teaching to the curriculum). Teachers must have the differences clear in their own minds and must make it clear in the minds of parents and students. Teachers should be given the curricular materials to work with, teacher training with the curricular materials, and a reasonable length of time to adjust to the curricular change as well as the time to plan to teach. She also posits the notion that each teacher must have 70 hours of training in the first year of implementation alone. This training must include such activities as peer-coaching, establishing parent workshops, and classroom observations by other teachers with feedback for the purpose of improving instruction. Briars finds that large school systems need more time to implement new curricula because they heavily tax existing resources in terms of materials that must be

purchased and it reduces the training time devoted to the new curriculum for teachers by overworking staff development specialists. Briers recommends that a two year implementation process be considered for successful implementation.

Contrast these findings with the MathLand implementation, when Department of Defense teachers began to use the constructivist approach to teaching math after only a short training period. Teacher confidence in teaching math was shaken to the core. Teachers were encouraged to facilitate, guide, and become a co-learner (Loveless, 2000).

> Change where it counts the most—in the daily interactions of teachers and students—is the hardest to achieve and the most important, but we are not pessimistic about improving public schools as institutions...But teachers can not do the job alone. They need recourses of time and money, practical designs for change, and collegial support. And they can succeed best if they do their work in partnership with parents. (Tyack & Cuban, p. 10)

Administrators and Curriculum Change

To be fair, it is important at this juncture to point out that not all administrators are educated in the art of change. In an interview with John Goodlad, Mark Goldberg noted that

> ...much of the educational leadership training in school of education does not give educators command of the change process. A leadership training program, Goodlad believes, should be a "logical continuation of the best training available to be a teacher." Too much of educational leadership training is for technical management. (Goldberg, 2000, p. 84)

> Miseducation and ignorance of research-based theories compounds this lack of training. Unfortunately, most educators (including many teachers, educational administrators, and professors of education) and almost all non-educators (including mathematicians, science and writers for the popular press) have no substantive understanding of research-based constructivist theory. (Battista, 1999, pp. 429)

Battista goes on to say that these same educators construct a meaning ranging from pedagogical, non basics, non-directed teaching to something analogous to discovery learning new math with elements of journal writing, cooperative learning with a dash of manipulative use.

Administrators, like teachers, need professional development regarding mathematics reform. They must be able to determine the extent to which standards-based programs are being implemented in their building and be able to assess their site-specific needs. A teacher attempting to implement standards-based instruction is demoralized when a principal, observing a lesson in which the teacher is facilitating small-group work, says, "I'll come back to observe you when you're teaching" (Briars, 1999, p. 25). Conversely, Briars (1999) said that the use of manipulatives or cooperative groups in the classroom is not proof that teaching, learning or constructivism is occurring. Administrators should be trained adequately to ascertain the difference. When it comes to change in the math curriculum, parents generally approach administrators for two reasons: first they are worried that the math that their children are learning is so dissimilar to what they learned in school that they think that their child is not learning the right kind of math. Second, they are concerned that they are unable to help their child

with homework. Principals should direct parents to resources that will ease parent concerns over these issues (Goldsmith, 2001).

Goldsmith also suggests that there are several steps that can be taken by administrators to improve success in mathematics implementation: research mathematics reform, study the standards introduced by the National Council of Teachers of Mathematics, do the math and participate in the learning process, share ideas, participate in professional development opportunities with staff, develop new methods of teacher evaluation, and finally, principals can rearrange structures like schedules by increasing common preparation and planning times. Common planning times increase the exchange of ideas among teachers and aids in promoting curricular change. Goldsmith (2001) also addresses several issues that administrators can do to promote math curriculum changes within schools.

> Principals, as instructional leaders in their schools, can help promote such changes and make a difference in mathematics education in three important ways. First, they can make sure they are prepared to lead by learning about the goals of and approaches to mathematics education reform and about the resources needed to improve mathematics education in their schools. Second, principals can lead and support specific school improvement efforts within the district. Third, they can help involve parents and other community members in efforts to improve mathematics education. (p. 54)

Supervisors faced two general problems during the introduction of new curricula: one was that there was generally not enough supervisory personnel to assist teachers with problems arising from the introduction of the new curriculum; second supervisors

underestimated the difficulty that the teachers would have learning the new material. Finally, supervisors were in many cases less knowledgeable about the new curriculum than the teachers (Sarason, 1996).

Administrators must also address the issue of teacher placement. In the back to basics approach, teachers who were weak in math skills could mask their weakness by focusing on computational procedures. Modern standards are more rigorous and require teachers in middle schools to have a secondary certification in math. Intensive professional sessions can not make up for this lack of education. Placement of certified and qualified teachers is critical to the success of a curriculum (Briars, 1999).

Administrators must take responsibility for making change. They must sharpen their skills as agents of change and focus on understanding the processes involved in change otherwise the change will fail or fail to be sustained.

A steady stream of episodic innovations—cooperative learning, effective schools research, classroom management, assessment schemes, career ladders, peer coaching, etc., etc.--come and go. Not only do they fail to leave much of a trace, but they also leave teachers and the public with a growing cynicism that innovation is marginal and politically motivated.

> What does it mean to work systemically? There are two aspects: 1.) reform must focus on the development and interrelationships of all the main components of the system simultaneously--curriculum, teaching and teacher development, community, student support systems, and so on; and 2.) reform must focus not just on structure, policy, and regulations but on deeper issues of the culture of the system. Fulfilling both requirements is a tall order. But it is possible. This

duality of reform (the need to deal with system components and system culture) must be attended to at both the state and district/school levels. (Fullan & Miles, 1992, p. 752)

The MathLand Initiative Within the Department of Defense Schools

In a DoDEA News Release in December 1998, Dr. Lillian Gonzales responding to parental concerns regarding MathLand, specifically addressed three issues: "K-6 Mathematics curriculum needs more focus on the basics; MathLand does not teach adequate skills; and teacher understanding"(DoDEA News Release- Progress in Resolving Issues, 1998, p. 1). Gonzalez directed that all teachers and schools would receive copies of the DoDDS Mathematics Curriculum along with supporting materials. These materials were to be supplemental instructional materials to include a textbook with more traditional math work. "Supplemental Materials Task Groups" were formed to select materials for improving mathematics instruction. This group would include parents, educators, and curriculum specialists. Change was also made in the normal adoption cycle for new materials. The new mathematics program would be presented during the 2000-2001 school year. This change is significant because it reduced the time for a new mathematics adoption by one year. No mention was given to the concern about teachers or teacher training (p. 1). The supplemental books were introduced in early February 1999, accompanied by a 45-minute parent meeting to announce the change.

These supplemental materials are the only materials that have been used by mathematics teachers since that time. Furthermore, no new curriculum materials have

been adopted. The end for the curriculum was swift and sure. After all of the parent meetings and huge amount of concern, MathLand ended with a whimper rather than a bang.

Summary

The literature points to several factors that assure success of new curricula, each plan has some merit and certainly deserves consideration when planning for curricular change. The void in the change process is not one of logistics, curriculum content, poor planning, policy change or politics. It is a change in the language of the curriculum being taught that attracts attention (Battista, 1999; Peterson & Deal, 2002) —a change in the grammar of the school (Tyack & Cuban, 1997). It is this change in culture that heightens parental concern and increases pressure on the teachers and administrators making the change.

It is not the quality of the curriculum that will predict its fate. It is the ability of parents to understand the grammar of the change, and it is the responsibility of the teachers and the administrators to educate themselves and parents in the grammar of that change.

CHAPTER III

METHODS

This study examined the interactions of administrators, teachers, and parents during the change process. The data collected was viewed through the lenses of change theory (Fullan, 1991; Cuban 1988) and grammar as a part of the culture in schools (Tyack & Cuban 1997). This research investigated how radical curricula alter the language (grammar) of the school and therefore result in a change in the culture of a school. Furthermore, this study sought to examine the ways in which radical change in curricula causes change in the dynamics of political infrastructures of the school. It was the aim of this research to determine the changes in grammar and the political interactions of parents, administrators and teachers brought about by the implementation of the MathLand program into the Department of Defense Schools. It was also the aim of this research to examine what course might be followed to assist in the implementation of new programs in the Department of Defense Schools or any educational institution making curriculum changes. It is hoped that this study has added to the body of knowledge concerning curriculum implementation resulting in improved transitions from old ideas and paradigms to new ideas and paradigms.

Study Design

I selected a qualitative paradigm for my research because it presented the most suitable format for me to gather and analyze my data. Merriam (1998) presented the qualitative case study as a method by which one could make "...an intensive, holistic description and analysis of a single instance phenomenon or social unit" (p. 21). Additionally, the study is well suited to a *bounded system* (Merriam, 1998) as MathLand was introduced into the Department of Defense Dependent Schools as a new program in September 1997 and ended when new mathematics books were introduced in February of 2000. It also meets Miles and Hurberman's definition of "a phenomenon of some sort occurring in a bounded context" (p. 25).

This study has a typically *heuristic* quality based on the four key elements proposed by Merriam (1998). Specifically, a case study can:

- Explain the reasons for a problem, the background of a situation, what happened, and why?
- Explain why an innovation worked or failed to work.
- Discuss and evaluate alternatives not chosen.
- Evaluate, summarize, and conclude, thus increasing its potential applicability. (p. 31)

This research was designed to discover the reasons why MathLand was not successfully piloted, implemented, and instituted as part of the mathematics programs in the Department of Defense Schools. The aim of this research was to detail the demise of the innovation, suggest reasons for the failure, and assist with the implementation of new curricula.

The Researcher

This year marks my 20th year in the Department of Defense Schools and my 26th year as a teacher. I have taught middle school and high school math, science, social studies and technology. During that tenure I have witnessed the introduction of many innovations and curricula. None of these newly introduced innovations or curricula were ever met with the disdain and hostility that MathLand received.

Both of my children received their education through the Department of Defense School System and were enrolled in the school system during the MathLand introduction. I attended several parent meetings about the MathLand program and listened to the presentations given by a variety of teachers at many grade levels. I did hear parents voice strong objections to the program as well as question the validity of the program with both a principal and the teachers during each of the presentations that I attended. My best assessment of this situation is that I did not form an opinion about the program; consequently, I believe that I have not developed a bias concerning the program. However, this research was not designed to test the quality of the MathLand program as a curriculum; the research is solely interested in the implementation of innovative programs as viewed through the lenses of change and grammar.

Researcher Bias

In my Department of Defense career I have seen the effects of both real and perceived pressure to make change. I have participated in parent conferences where parents have openly stated that they felt Department of Defense Schools' teaching methods and curriculum were somehow not as good as school systems in the United States. Even though standardized testing did not agree with those opinions, it appears to me that new programs that were established in Texas or in California have been introduced in order to allay those feelings. My opinion is that many of these programs were abandoned by the states where initial adoption took place, but the programs remained in place in the Department of Defense System long beyond that point.

In my own experience, I have found few reviews of published curriculum for administrators to read, and the publishers themselves write many of the reviews that are available. Reading reviews written by people whose job it is to sell books or curricular materials influences the selection of materials. Selection of curricula is based on selections made by states with large populations. The assumption is made that someone in that larger state or school district has researched the curriculum as a product and then made a recommendation for a statewide or large school system buy. I believe that the Department of Defense follows that plan, or a similar plan, when a curriculum review committee is not convened before making a new curriculum purchase.

I believe that the success or failure of many programs rests in the hands of the teachers and administrators given the task of implementing them. It is their skill and determination as consummate professionals that assure the success or failures of programs regardless of the quality of the program. I also subscribe to Sarason's (1996)

notion that changes in programs handed down from above the classroom level are changed and modified to meet local needs. Peer review along with evidence provided by data collected in the interviews were used to support instances of curriculum modification.

Respondents and Their Context

Data was collected in the form of long interviews from parents of students who were in the MathLand program, and from teachers, and administrators who were involved in the implementation of MathLand in the Isles District or elsewhere in the DoDDS system. All participants had and still have students in Department of Defense Schools or are actively involved in teaching or administration.

Actors

My research included three distinct groups of actors who were most involved in the change process:

1. Parents, the actors who were involved with the problems of homework and concerned about the change in the grammar of math
2. Teachers, who were charged with making change in their classrooms, using the new grammar, and implementing the new curriculum.
3. Administrators, the actors who played an executive role in the process of implementation.

Administrators are the educational leaders of their schools, and the liaisons between teachers and parents. Administrators were tasked with assuring the

implementation and success of the MathLand program. Parents were active military or civilians who had children in the MathLand program during the implementation process.

Some actors were interviewed in their dual role as parents and teachers. The same was true of some of the administrators.

At least three years has separated the actors from some of the events so recollections occurred slowly during the interview process. This difficulty with recollection was even more evident when interviewees did not review the interview questions. At least five participants were in other Department of Defense districts when the implementation began and have since transferred into the Isles District. All actors were employed by the Department of Defense and were on active duty in the Isles District.

Setting

The Department of Defense granted me permission to conduct research in the Isles School District. These schools cover a geographic area consisting of England, the Azores, Iceland, and as far to the east as Bahrain. According to the DoDEA web site (http://www.eu.odedodea.edu) there are more than 7,000 students in the district and more than 525 teachers. The schools are modeled after typical schools of comparable populations located in an average community in the United States.

DoDDS schools are accredited by the North Central Association Commission on Accreditation and School Improvement and are inspected by accreditation teams on a regular basis. The schools offer a wide variety of intramural and extracurricular

activities ranging from football to fencing. There are scouting and church organizations as well as swim teams and bowling leagues for students to join.

There are many single family and second marriage families in this study population. The main difference is that unlike families in the United States, parents are employed by the Department of Defense and children are allowed to attend based on being the dependent of an active duty military member or civilian contractor working for the federal government. The schools are exclusive to military and federal employees. As a result, the parents of DoDDS students do not experience loss of income due to unemployment. Many parents are career service personnel. Teachers were informed by administrators that military parents are encouraged by commanders to attend school events, they are given time off to attend parent conferences and open house activities. Parents are also encouraged by commanders to play an active role in their children's education. Since administrators, teachers, and parent-teachers are not allowed to run for office, military members and their spouses assume leadership roles in the Parent Teacher Associations, local school boards and parent advisory groups at the local, district, and regional levels.

Sample Selection

The site selected was representative of a typical military school complex consisting of elementary, middle grades and a high school. No consideration was given to rank or status when parents, teachers and administrators were selected to interview. Participants simply had to be interested in answering questions about the MathLand

program. A copy of the interview protocol was offered to all prospective participants and accepted by only two interviewees.

None of the teacher participants were novice teachers when they were teaching the MathLand program and all received some degree of MathLand training. None of the administrators who were interviewed had taken MathLand training. Teachers, administrators, or parents did not solicit me as a means to publicize their particular feelings about the MathLand program.

All administrators were experienced in administration when they were supervising the implementation of the program. All administrators had dealt with MathLand issues during the implementation process. Every effort was made to locate a range of parents who had students at different grade levels, teachers who taught at different grade levels, and administrators who supervised a range of grades when MathLand was being taught.

The following table outlines the demographics of the participants. The names are pseudonyms and have no connection to the people that participated in the study.

TABLE I

INTERVIEWEES

Name	Gender	Ethnicity	Category	Education
Sarah	Female	Caucasian	Parent-Teacher	Masters
Brenda	Female	Caucasian	Parent-Teacher	Masters
Paul	Male	Caucasian	Parent-Teacher	Masters
Patrick	Male	Caucasian	Parent-Teacher	Bachelors
Peter	Male	Caucasian	Parent-Teacher	Bachelors
Sheri	Female	Caucasian	Parent-Teacher	Bachelors
Joan	Female	African-American	Teacher	Masters
Dick	Male	Caucasian	Parent-Administrator	Masters
Dennis	Male	Caucasian	Parent-Administrator	Masters
Stephen	Male	African-American	Parent-Administrator	Masters
Amy	Female	Caucasian	Administrator	Doctorate
Linda	Female	Caucasian	Administrator	Doctorate
Sue	Female	Caucasian	Parent	Associate
Marj	Female	Caucasian	Parent	Associate
Ed	Male	Caucasian	Parent	Bachelors
Maureen	Female	Asian	Parent	Bachelors

The Respondents

At least three years separated the respondents in this study from the events so, recollections occurred slowly during the interview process. Not all interviewees were in the Isle District when MathLand was implemented; five were assigned to other Department of Defense districts when the implementation began. They have since transferred into the Isles District. At the time of this study, all respondents were employed by the Department of Defense and were on active duty in the Isles District. Some were teachers; others were administrators. Some were active duty military members; others were civilian contractors working for the Department of Defense.

Data Collection Procedures

All interviews were recorded on a hand-held tape recorder. Participants were fully aware of the recorder. None of the interviewees objected to the recorder or asked for it to be turned off, or the interview stopped. Audiotapes were then transcribed onto disk using Microsoft Word (NT). No names were used on the interview tapes. Each recording tape was coded and the identification of the participant was kept in a record book. All recording materials and transcripts were kept secure. Only my dissertation advisor had access to the data and files.

The interviews were on-site interviews in the classrooms with teachers and in homes with parents. Classroom doors were closed and a sign was hung to insure privacy. Dates and times for the interviews were made with mutual convenience in mind. Administrator interviews were also done at the convenience of the administrator, two interviews with administrators were rescheduled three times. The audiotapes were quickly transcribed, reviewed for accuracy and given to the participants along with a copy of the transcript. No copies of the audiotapes were made or kept.

Data Analysis

Data analysis will follow the ethnographic approach as defined by Merriam (1998), "...an ethnographic study focuses on the culture and social regularities of everyday life"(p. 156). "While educational ethnographers may use these schemes, more often a classification scheme is derived from the data themselves. The scheme can employ terms commonly found in the culture itself" (pp. 157). Coding and data analysis was accomplished using the category construction method Merriam (1998). "Categories

and subcategories (or properties) are commonly constructed through the constant comparative method of data analysis."(p. 179).

Accepted Limitations of Computer Analysis

Merriam (1998) lists a series of concerns about computer assisted data analysis. There is a fine line drawn between data analysis and data management. In this research I clearly acknowledged the problem and endeavored to use separation and sorting of text as a management tool. All analysis was done by reading the selected passages within the context of the portion of the interview from which the data was taken. The selection of software analysis was being used to take the tedium out of the analysis allowing me to focus on the material and information gathered to form a more complete picture of the data being interpreted.

The coding focused on the themes of change, grammar, and on the interview questions, using language to describe the MathLand program as compared to the former math curriculum. Yin's (1994) case study research mode was followed and used to compare the literature supported by grounded theory with the findings of the interviews. Next I used the information learned from the interviews to form an "explanation" for the events that followed. This interpretation sought to explain the role of grammar in the change process and further, and explain the demise of the MathLand program in Department of Defense Schools.

Multiple peer reviews were used to assure that the analysis of the study remained focused. Interviewees were provided a copy of the transcript of the interview and encouraged to read it for accuracy and meaning of the interpretations. Grammar and

word usage corrections were requested by 4 of the interviewees. No changes were requested to the body and integrity of the interview.

Verification

Verification of this study was made by using the following criteria as outlined by Creswell (1994): Ethical Considerations, Internal Validity, Triangulation, Member Checks, Peer Review, and External Validity:

> Ensuring validity and reliability in qualitative research involves conducting the investigation in an ethical manner. While well-established guidelines for the ethical conduct of research date back to the late 1940s, only recently has attention been given to ethical concerns unique to qualitative research. (Merriam, 1998, p. 198)

"Being able to trust research results is especially important to professionals in applied fields, such as education, in which practitioners intervene in people's lives." (Merriam, 1998, p.198). The following sections will address each of the challenges to the verification process.

Ethical Considerations

All researchers have an obligation to protect and preserve the rights of the participants in the study. These rights, according to Merriam (1998), are that the participant is entitled to a series of ethical considerations throughout all stages of the research. The burden of protection of these rights does not terminate with the interview

or even the end of the study. The following considerations were implemented to safeguard these rights during this study.

Participants were provided with a written overview of the research accompanying the invitation to be interviewed. Questions to be used in the interview were also provided at that time.

1. Written permission was obtained from the Department of Defense Educational Activity in order to conduct the interviews.
2. An application was written and written permission was received from the Oklahoma State University Institutional Review Board to conduct the interviews in this study.
3. Strict protocols were outlined by each governing body about the conduct and safeguards that would to be followed during the interview process.
4. Before each interview, a verbal announcement was made concerning the purpose of the interview and the interviewee's right to stop the interview at any time and request the audiotape.
5. The interviewee could choose the time and location of the interview.
6. Verbatim transcripts were made available to all of the participants. A copy of the finding from the data will also be made available to them.
7. All audiotapes, verbatim transcripts, computer disks, field notes, and codes for notes are secured in a locked cabinet and will be destroyed after two years.
8. As per directions from the Department of Defense, for purposes of identification schools will be identified as "A school from the Isles District".
9. Only my advisor will have access to the names of the participants.

Internal Validity

Internal validity deals with the question of how close research matches reality. (Merriam, 1998) LeCompte and Preissle (1993) list four factors that support the claim of high validity: living among participants, informant interviews, participant observation, and ethnographic analysis. I believe that I have met these practices.

First, I have worked in the Department of Defense for the past 20 years, therefore I am familiar with the curriculum implementation practices and the training that teachers receive when new programs are introduced. My own children participated in the MathLand program and as a parent I have attended many meetings about MathLand. Second, the data sources are easily sorted into empirical categories starting with which role(s) each actor plays. Some are both administrators and parents; some are teachers and parents. Others are parents that have an opinion about MathLand that they are willing to share. Third, the participants were invited to select the time and place for the interview, they were reminded that there would be no compensation of any kind for their help, that I would protect their anonymity and that I would surrender the tape of their interview following transcription. Every effort was made to make the interviewee as comfortable as possible. Finally, participants were encouraged to state specific examples of details that they alluded to during the interview. I made every effort to gain insight and give meaning to the details provided in the interviews.

Triangulation

Efforts were made to insure that the data sources came from as many different levels of administration, and teachers, from different grade levels as possible. Sampling

was done in all schools from the classroom level, to administration, to parents of students who attended those schools. Many actors who were interviewed had a bias against the MathLand program. In this research, I included interviews with parents, teachers, and administrators who had decided that the MathLand curriculum was not a good choice and others and also those who favored it. One parent, Maureen said, "They [teachers and administrators] talked to the parents, brought the parents in and sent out a letter asking them to come to a meeting. So we went to the meeting and it was so close to the Montessori that my daughter had been taught a Montessori method that we were just thrilled because we thought it was going to really help her and enable her to do well in math. And it has, because she did it for two years and then she had the Montessori program, so she's doing really well."

Member Checks

Interviews were transcribed and returned to the participants for corrections, additions and deletions. Some did not remember saying some of the words spoken in the interview. When asked if they wanted the words deleted they indicated that they did not but played the interview tape back to assure the accuracy of what was said. No corrections were made except for points of clarification. Two transcripts were edited by mutual consent to allow for clarity.

Peer Review

Several peers have reviewed my work over the course of this writing. One peer in particular has collaborated with me and has helped me to stay focused on the purpose of the research. We have collaborated on our research for more than three years. I have found his points of view and his suggestions instrumental in the success of this research and in helping me to narrow the focus of this study. His help continued throughout the course of this research during data analysis and in the conclusions found during this investigation. Other peers in my cohort group have offered constructive ideas for changes in my methods of presentation and writings for the purpose of clarity and ease of understanding.

External Validity

The external validity of this study is determined by whether it can be applied to similar situations that will arise in the future. My belief is that curricula are the backbone of school culture. They are dynamic living documents and as such will continue to undergo revisions and improvements as technology and teaching methods change. Curricula of the future will include new grammar; this grammar will change the culture of the school and the way that teachers teach. It is hoped that this research will prove that education in new grammar for all actors is an essential part in the implementation process.

A record of my data collection methods and analysis has been maintained to insure the integrity of the research and the findings. An accurate account of the decisions, questions, and methods leading to my findings was maintained. My university

advisor has reviewed my materials and processes during all phases of this research. In the final analysis, it will be up to the reader to decide the applicability of my research and whether this research will assist in the implementation of new and radically different curricula.

Reliability

Merriam (1998) states that there are three areas of concern when looking at reliability: the conceptualization of the study, the ways in which the data were collected, analyzed and interpreted, and the ways in which the finding were presented. Merriam alludes to the fact that there is no benchmark for repeating measurements and establishing reliability in the traditional sense when dealing with research using human beings. It is an interpretation of what is happening during a moment in time—a snapshot. The best source for reliability is internal validity.

Summary

The introduction of any radically new curriculum into a school system changes the grammar of the school. The research for this study attempted to discover the ways that a change in grammar changes the culture of a school and contributes to the failure of new curricula. Questions concerning politics of change, grammar, and radical new curricula were asked of parents, teachers and administrators in the Isles School District in an attempt to find the role that grammar played in the demise of MathLand.

The literature on curricular change is rife with suggestions about procedures that will help in the change process when implementing curriculum. My own experiences as a

classroom teacher and the guidance of my advisor helped to narrow the focus of the study and develop the research as well as the interview questions. These questions set forth in Chapter I guided this study. The aim of this research is to use data collected from the actors involved in the curriculum implementation of the MathLand program in the Department of Defense Schools.

Data has been collected from three groups, administrators, teachers, and parents, and was analyzed using grammar and change as the lenses to focus the study. Triangulation was achieved by using three different groups of people from different grade levels, who have different responsibilities for the implementation process. The openness of the data to the participants and the format of the data presentation added to the validity of the study. Reliability was fulfilled by the rich, thick description of the setting, data collection procedures, and researcher bias.

During the entire process, the ethical standards outlined in this chapter were followed. The standards for both the Department of Defense Educational Activity and Oklahoma State University Institutional Board of Review directed my efforts in this study.

CHAPTER IV

DATA PRESENTATION

INTRODUCTION

Dear Student,

This week you have been using logical thinking to find and name differences between attribute pieces. Here is a game that will really make you think. It's a version of the old classic, Tic-Tac-Toe.

Home Work
Tic-Tac-Toe Moves

Draw a Tic-Tac-Toe board. Collect three pennies and three dimes to use as game markers. Follow the rule below. Play the game several times.

After you have played the game for a while, write about the game. How is it different from regular Tic-Tac-Toe? Did you develop any strategies to help yourself win? If so, write about your strategies.

Rules for Tic-Tac-Toe moves

1. For markers, one player uses three pennies. The other player uses three dimes
2. Players take turns putting down their markers until all six coins have been played.
3. If no one has three markers in a row, take turns sliding one marker to the "next door"square.
4. All vertical and horizontal slides are allowed. Diagonal slides are only allowed into or out of the center square.
5. Continue playing until one player has three markers in a row.

(Charles, Randolph-Brummett, McDonald & Westley, 1995, p. 11)

If you read the above math homework probably two very important thoughts came to mind. One, what has this assignment got to do with math, and two, this is a very different homework assignment. If you entertained either or both of those thoughts, then you have gained an insight into the mind of a parent of a MathLand student.

Imagine the stunned silence that gripped the after dinner study hour at the kitchen table when you asked your 4th grader about what he, or she, learned in math today and the response is, "A new way to play tic-tac-toe." Then imagine the look on the face of a parent who works in the audit department at the base hospital when that same 4th grader said, "Yeah...tic-tac-toe, and I'm going to need some help to finish it for homework." Imagine an administrator telling a teacher steeped in the ethos of teaching traditional math that this is the "new way" that they will teach math. And further, that these homework sheets, and others like them, will be the only types of tools that they will be allowed to use. Imagine, if you can, a teacher explaining the reasoning behind that particular homework assignment to the parent who has not been educated in the changes that MathLand will bring.

As an artifact pertaining to the study of curricular change within the context of culture, tradition, and the language of math, the Tic-Tac-Toe homework assignment can only be labeled as different. It must be noted that the homework assignment is not a minor deviance from traditional math; it is a quantum leap into the unknown. It is a change in the culture of math in a school system, a change in the language of math.

Parent-Teachers/Teachers

Simply put, a teacher had the sole responsibility to follow the directive to implement the recommended change without modification. From the interviews I learned that not all teachers were prepared to do that. When considering the word "prepared," the respondents revealed that "prepared" took two forms: being willing to teach MathLand, and possessing the basic mathematical knowledge to teach MathLand. In an effort to sidetrack bias and general dissatisfaction with MathLand as both a product and a process, I looked for teachers who ignored those issues and focused their efforts on teaching children. During the interview Sarah said, "I know at the time a lot of teachers were so uncomfortable with it that they went ahead and continued to do a lot of their own types of things. But I tried to follow through with it and do it the way that I understood it was supposed to be done."

When it came to novelty and innovation, I sought out teachers that were enthusiastic about their teaching and were willing to put their hearts and efforts into making a success of whatever they were given as curriculum. Brenda said:

> I just think, and having a teacher be a facilitator and sometimes listening more to their math and how they do their math or let them talk about it was better. And one more thing! There, you, this is a thing that I used to just love. We would also, when you'd do that 'Convince Me,' there's a, you'd see kids tell you how they got an answer to a problem and you'd think, 'Oh yeah! You can get the answer that way. But that's not the way that I would do it.' And I was biased because I'd always teach kids how to do math the way that I was taught and I, and

what works for me. But guess what? There's other kids out there that think a totally different way, different steps, but they get the right answer.

Sarah and Brenda. Sarah has 2 children and Brenda has 3. Neither of Sarah's children experienced MathLand, Brenda's oldest daughter, now a junior in high school has. Both of these parent-teachers did their best to assure the success of the program. Not once during the interviews with these two teachers did they indicate an attempt to revert to using old materials. They embraced new ideas and concepts, and, what is more, they tried to incorporate those strategies, plans, and ideas into their teaching.

Both parent-teachers continued to promote the changes that were introduced by MathLand, along with the new materials that came with the curriculum. Both taught the curriculum with the needs of parents and students in mind. Sarah and Brenda are just such teachers. They possess the ability to rise above personal preferences and focus their efforts on teaching their students. They are the teachers that we would all love for our children to have. Sarah is a middle school math teacher and Brenda is an elementary teacher. They were wonderfully honest, candid, reflective, and insightful. They used a positive attitude and an open mind when it came to embracing the new materials and methods handed to them along with the MathLand curriculum. They got down to the business of teaching it.

Patrick. Patrick is an elementary parent-teacher who had misgivings about MathLand and continued to promote the program in his classroom while others in the building were "Doing their own thing." He felt well trained and confident about the MathLand program and ready to teach it. Unlike Brenda and Sarah, Patrick was unhappy

with the changes brought in with MathLand, but once he had his say, like Sarah and Brenda, he too got on with the business of teaching.

Patrick felt pressure from a variety of sources. He experienced and perceived pressure from the District superintendent's office, his principal, parents, and his peers. He related this experience, and the effect that it had on the implementation process. After more than two years of struggling with MathLand Patrick finally began to modify the program to fit his needs and his teaching style.

Peter. Peter is another experienced elementary school parent-teacher. He has worked in the Department of Defense Schools for more than ten years. His candor about the difficulties that many teachers experienced brought perspective to the difficulties that many teachers face when change is implemented. Peter was open and honest about his feelings about the changes that were brought into his classroom with the introduction of MathLand. During the interview, Peter said, "To be honest, it hit me out in left field. I had no idea that it was going to be that radical of a change". There is evidence of initial shock due to the change followed by a general retreat to old methods. First a look at the shock brought on by the sudden change.

Peter was very honest about what he tried and when it was abandoned. He admits that there were teachers in the building that were identified as lead teachers and he tried to follow their lead, but soon frustration and confusion about language, methods, and expectations overwhelmed him. Added to this commingle was the genuine sense that he was not adequately trained and the fear that he was not prepared for the challenge of something radically different. The result was a modified mathematics program when the classroom door closed.

He did not commit a planned departure from the changing curriculum. His enthusiasm for new and radically different methods and curriculum was clear and evident. His departure was a return to the comfort level of any teacher who has been teaching for a long time and experienced the anxiety and frustration of not coping well with change. Pressure came from lead teachers who either had a math background or additional training. Parents seemed sympathetic. Administrators were pragmatic. He said, " I think our administration was fairly sympathetic to our misgivings or our apprehension or whatever the word is, to the whole thing and so they gave us a lot of leeway."

Paul. Paul was a high school social studies parent-teacher and had two children one is a senior, the other a sophomore both were taught MathLand during the implementation process. He was considered by peers, parents, and administrators to be an exceptional teacher. He has received exception ratings in performance evaluations for many years, he has given graduation addresses on more than one occasion, and his classes are among the most sought after on the high schedule. He was open, honest, and innovative in his teaching methods and delivery. He supported initiatives that he considered beneficial to the profession and to his students.

Paul shared some of his concerns about the MathLand program and the personal dilemma that he, a teacher, and a parent found himself in when trying to come to grips with institutional change. He stressed the difficulty that a parent-teacher in the system had to deal with when faced with a change with which he or she might not agree.

Sheri. Sheri worked for the school system in the Isles District as a paraprofessional and later as a parent-teacher. Sheri had three children who were in the

MathLand program. Sheri was a dedicated professional who supported the school and school policies. She was a student advocate and believed very strongly in traditional teaching methods. She expressed concern about the sudden detour that her oldest of three children took during the MathLand implementation.

Sheri was a parent who knew about the reluctance of classroom teachers to abandon traditional materials. She believed that her younger daughter had more of an advantage in math because the teacher kept some of the materials from the old program. Jenny's younger sister was being taught "real math."

Joan. Joan was a seasoned elementary teacher, having taught for several years in grades one to four. She was reserved and spoke in a soft but commanding voice. Joan was a no nonsense teacher and well versed in all the subjects that she taught. She was receptive to a math curriculum change and believed that the change would improve the math ability of her students. She was also concerned about the quality of materials given to her with the curriculum. She considered them incomplete; she felt oversupplied with manipulatives and undersupplied with other support materials. She considered her training for the task of teaching MathLand to be inadequate.

Like her colleagues, Joan felt the need to supplement the MathLand materials with materials used to teach the old curriculum. Like Peter, Joan retreated to materials that supported the old math curriculum and fit well within her own comfort zone for teaching. It did not take long for her to begin doing that.

Parent-Administrators

In simple terms like, here is the change, why are teachers not making the change? An administrator would find that they are the educational leader in their school and that they can implement a curriculum change simply by following directives from above school level, and seeing that individual teachers implement that change. Interviews showed that this was not the case.

Parent-Administrators are similar to parent-teachers because they are bound by the same information as a parent-teacher, but at a much higher level. As educational leaders, they too are bound by the ethics of a silence that shelters any organization during periods of crisis, and MathLand created just such a crisis.

It is my deepest belief that the level of honesty and frankness that was freely shared by this group of individuals three years following initial implementation is much greater than it would have been during the implementation process. The administrator-parent also shared the parental concern verses the institution needs when it came to voicing concerns about the MathLand program.

Dick. He also spoke to other administrators about MathLand being "an example of an incomplete program," but it was his reflection on the MathLand experience that best summed up his feelings about the program. He was a middle school administrator and had one child who was a MathLand student. He supplemented MathLand at home by using an additional book recommended by his son's math teacher. Dick supported the change to MathLand but assumed the responsibility for teaching math facts to his son at home. He believed that MathLand did not do enough to support the math needs of his son and supplemented his son's education in mathematics at home. He said, "I am not

sure everybody presented the MathLand program the same. Based on that experience then, we needed to have some concrete math functions. Last year in fourth grade, we bought an additional book besides what DoDDS was using and he worked the whole thing. Saxon math seems to have a little bit different approach. Not that it didn't teach the process, but it emphasized getting the right answer over emphasizing the process."

Dennis. Dennis is an administrator in an Isles District elementary school. He is well liked by the community and he has the age, prestige, and charisma that makes parents feel at ease from the first meeting on. I doubt very much that this great interview would have occurred three years ago. He brought to the interview the wisdom and confidence of 30 years as an educator and many of those years were spent as an administrator. He has three children. Two of his children were in the MathLand program.

Dennis had concerns about the MathLand program from the start. He saw the methods used to implement MathLand as part of the cause for the failure of the program. He felt pressure from teachers and parents during the implementation process, but most of the pressure came through the chain of command. During the interview, Dennis shared the pressure that he felt when he said, "As an administrator at an elementary school, I had to have it implemented. That was my job to make sure it got implemented. I didn't agree with what they [above school administrators] were doing. I didn't like how it was implemented but I felt the pressure in that I had to get it out there. He empathized with both the teachers and the parents but he still recognized that, as the educational leader, it was his job to complete the implementation process. He took on the

responsibility of both the MathLand implementation, the education of his teaching staff and parents using all available resources.

Dennis worked to relieve the tension caused by the rapid change. His authority and energy was directed at educating his faculty and parents as opposed to sending out directives to get the job done. When the implementation was finished, Dennis had a facility that functioned with him and not around him. Dennis saw the importance of educating teachers and parents about MathLand. He used the resources of his school and teaching staff to accomplish this with great effect.

He did not allow the problem to sit and simmer; he brought two key elements together to help solve the implementation problem. First he identified both parents and teachers as keys to the success of the implementation. Then he allowed his teachers time to work together with parents in order to teach parents about the MathLand program. Teachers who knew and liked the MathLand program came together with concerned parents to help them overcome some of their apprehension about the MathLand program. It was the logical next step, but it was a brilliant answer to a very complex problem.

Stephen. Two of Stephen's three children were exposed to MathLand. He is a quiet and able administrator respected by both peers and the teachers who worked for him. He was broadminded about teaching techniques and encouraged teachers to explore new and different ways to present material. He was just entering the administrative ranks when MathLand was introduced.

He never openly stated whether or not he liked or disliked MathLand. He did refer to his own education when he made comparison statements. Like Dennis, Stephen

identified a lack of teacher training as one of the key factors in the failure of the program. He applauded the use of manipulatives by the teachers and students.

Stephen supported the MathLand program as both an administrator and as a parent. He attended parent-teacher meetings about MathLand to show support as a parent and an administrator. He too saw differences in the language and concepts used in the MathLand program. Like other parents, Stephen was concerned about the lack of a textbook, and difficult worksheets to tackle at home, but he was enthusiastic about the idea of group learning and teaching math concepts.

Stephen knew that there were parents who were not impressed by the introduction of MathLand and that there were parent groups forming in opposition to the program. He did not participate in any activities against MathLand, but he could clearly see that the end was in sight for the program.

Administrators

Initially, administrators were not totally aware of the impact that MathLand had on the DoDDS schools. It was not until parents started to share concerns that administrators began to look more closely at the MathLand program. Amy summarized the situation by saying

> I remember a number of things. It was real important to have parent meetings right at the beginning because there was quite a bit of parent backlash. They didn't like the program. So it started for a couple of months, and because the students didn't have books to take home and have math problems every night.

Amy. Amy is a career educator and administrator of 14 years with no children. She has an excellent reputation as an able administrator with an eye for detail. Her experience with MathLand extends back to its initial adoption and introduction into the Department of Defense Schools. She served as an assistant principal during the implementation process.

Her focus of concern was the communication among schools, teachers, and parents. She also expressed concern about the readiness of teachers to teach the MathLand program. Amy's concern was focused on the training and ability level (ready to teach MathLand) of individual teachers. Failure to implement had nothing to do with whether a teacher was willing to teach MathLand. Parent unrest about MathLand prompted concern about what was happening in the MathLand classrooms. Her visits to classrooms were diagnostic. Amy was more interested in troubleshooting than policy enforcement.

Amy expressed her concern about the readiness of teachers to teach MathLand and the concern of parents about the MathLand program. She addressed the lack of post-implementation training as one of the problems that surfaced in the transition from the old math curriculum to the MathLand curriculum. Another problem was finding a way to ease the anxiety of parents by holding meetings about the MathLand program in order to assist the parents in the transition *post facto*. Both issues were addressed too late. During the interview Amy said, " The parents started to get upset, so the parent meetings probably should have happened before the program started, but they then started to take place as a result of parent concerns". When asked if teachers had adequate training, Amy said:

After the fact. I don't remember that [training] happening beforehand, but I thought it went far beyond that. The program [MathLand] really required teachers to have a fundamental understanding of mathematics and, from my experience, um, several years before I attended a math-training workshop and it was middle school and elementary school math teachers. In the workshop they were talking about base 10, and probably 90% of the teachers in the workshop did not understand the concept of, of base 10. So they understood mathematics on a very surface level and didn't understand the fundamental mathematical principles behind it and MathLand really needed to, to understand that and patters and, and all those kind of things, so it was really almost like teaching a foreign language to the math teachers.

During the implementation process, Amy indicated that she did not feel pressured, but it was obvious that parents were upset by the change. Amy was also aware of the concern that parents had about not being able to assist students in doing the MathLand homework.

Amy addressed the issue of a reluctant teacher corps during the implementation process. There was no condemnation of the teachers for this reluctance. It was more clinical analysis of that behavior than condemnation. Amy wanted to know why teachers were failing to implement. She was not looking for implementation at any cost. Amy found that teachers were reluctant to invest their time in planning to implement the program. Instead, they were spending time working on answering questions in the book just ahead of the students. Many teachers were reluctant to implement the program even after several months had passed. These teachers were also at varying levels of understanding and at different points in the implementation process. The implementation

process was made even more difficult for teachers because of an incomplete curriculum buy. Some teachers were learning the material that they were teaching just ahead of their students. An additional ten dollars more per teacher could have eased the difficulty of problem solving for teachers.

Amy also seemed puzzled by the implementation of a program that had failed in other places. DoDDS had a preview of things to come when they saw the failure and opposition of parents in California before the implementation of MathLand in the Department of Defense Schools. Amy indicated that parent directed the questions about MathLand at the teachers rather than administration.

Linda. Linda is an administrator with an excellent reputation as an educator and teacher. She has worked in several administrative roles and has successfully advanced her career in DoDDS from classroom teacher to administrator. She is well liked and respected by teachers, administrators, parents, and students. She is married with no children and served as an administrator during the MathLand implementation.

Linda identified several issues that hindered the implementation process. There were different levels of teacher training and a change in the established practice of using a mathematics textbook. She noted that, for the first time, DoDDS was trying to educate parents, albeit after the fact, about a curricular change.

Linda had a refreshing perspective about the pressure exerted by DoDDS on local administrations to get the MathLand program fully implemented, the reaction of parents to a suspect curriculum being implemented and having teachers at different levels of understanding and proficiency during the implementation process. Unlike Amy, Linda

identified pressure applied by school officials and parents during the MathLand implementation. Like Amy, she understood the concerns of parents.

Linda also emphasized how important the issue of communication and keeping lines of communication open is for an administrator. Linda, like Amy, had a sense that the teacher and parent training for MathLand was poorly done. Linda said

> They had the training, say, as lead teachers or as teachers who were going to be implementing this first, and those who weren't necessarily interested in that approach or that well trained in that approach didn't get as much training and time to process the approach and therefore weren't ready when it came. Other parts were that some of the public relations activities that would help parents understand this program--which wasn't going to have a traditional textbook with traditional homework and/or workbooks that have been the way learning or math has taken place in the past--those activities that would prepare the parents for the dramatic change weren't always done. I don't think people predicted, uh, the concern parents would have with not having a math book. And so, with hindsight it's of course easy to say it would have been helpful to have done that ahead of time.

Parents

To get a more complete picture of the implementation process, the interviews had to address parental perceptions, viewpoints, expectations, and concerns. Parents were key players in the implementation process. They acted as managers of their children's education and participated in the education and implementation of MathLand by helping

their children with MathLand activities outside the classroom. I interviewed four parents; one parent who volunteered expressed positive feedback about the MathLand program. None of the parents who were interviewed indicated any anger about the results of the MathLand effort. The respondents did reflect parental frustration due to the difficulty parents found in assisting their children with math homework. I uncovered a sense of helplessness parents felt about the math that their children were learning.

Sue. Sue was involved in volunteer work at the elementary school. She served on a parent group, (the School Improvement Leadership Team (SILT)); this group worked in conjunction with the District Superintendent's Office. Sue was a willing and able interviewee who was honest about her experience with the MathLand implementation. Sue has two children in the school system and both children were taught MathLand in the Isle District.

Sue indicated that she was a DoDDS alumnus, but new to DoDDS as a parent, and very open minded about change and curriculums being offered. Sue was educated for a time in DoDDS schools and holds them in high regard.

Sue had concerns about the MathLand program; she also talked to other parents who shared similar concerns with her. She was the assistant chair of the School Improvement Leadership Team (SILT) for the school. This powerful group had as members, grade-level coordinators and the school principle, people who could make change. The SILT served as a standing committee during an accreditation visit by the North Central Association (NCA). MathLand took a priority on the agenda of that committee.

Sue was in a unique position to influence the course that was followed in making change. She was bolstered by the support of other parents while she was on the SILT committee. The problem was shared with an outside committee sent to evaluate the entire school program. Parents who had concerns were provided with an open forum where they could voice concerns about MathLand. Sue followed a chain of command in order to voice her concerns and also the concerns of other parents about the MathLand program. The NCA visit provided an excellent opportunity for a parental assault on the program. The results of the parent pressure group are uncertain, but change quickly followed the NCA visit.

Maureen. Maureen reacted to hearing about my research by asking for an introduction and offering to be interviewed. I was researching something to do with MathLand. She introduced herself to me and said that she did not have a lot of time but wanted to express her views about MathLand. She immediately began to tell me about her views on MathLand. I interrupted her in mid-sentence long enough to ask for an interview and she agreed.

Maureen was very enthusiastic about the MathLand program, but returned to the United States after the implementation year. After two years in Kansas her family was stationed in the Isles District. She expressed disappointment when she discovered that DoDDS had abandoned the program. She believed that the program helped her child to develop strong problem solving skills.

Maureen was able to clearly articulate the differences between the way that she learned math, and compared it to the MathLand program. Like other parents, Maureen found the MathLand program a challenge during homework sessions. She was a

substitute teacher and experienced some difficult moments in the classroom, but her enthusiasm for the program never diminished. Her disappointment about the curricular change was clear.

Ed and Marj. I have known Ed and Marj for several years and their son was in my classes. I can remember their asking for a parent conference to discuss their child's progress. Their son was an honor student and the issue was really MathLand. Both parents asked to be interviewed, but insisted on being interviewed separately. Neither parent looked back favorably upon the MathLand program.

Marj was a product of the 'Volkshochscule' (German middle school from 6th to about 10th grade), where rote memorization was the order of the day. She argued that drill and practice is the only road to improvement. Her expectations for math mirrored her own experiences. She worked as an aide in the local schools.

Ed is an easy going, educated and hard workingman with high expectations for his son. He supported the DoDDS school system and believed that it is providing to be an excellent education for his son. He is a professional contractor working for the Department of Defense, but was not connected in any way to the school system. He reminisced about his own excellent educational experiences and established the same expectations for his son.

The interview turned to what parents felt could have done to help the implementation process. Ed and Marj were not politically active in the school system. They did not try to pressure teachers or administration to make change, but they did share their concerns with the teachers.

Ripple Effect

The interview data uncovered links that suggested a language change occurred during the introduction of MathLand. Specific areas of concern arose due to a failure to fully grasp a working understanding of the nuances of the MathLand program. I also found concerns about training; levels of training were related to but not limited to the concept of being prepared to teach. The concept of teacher preparation is manifested in two forms: formal training, as attaining a major in mathematics during teacher training, thereby giving clarity to the intricacies and mysteries of mathematics, contrasted by an undergraduate *Introduction to Mathematics* course required for elementary certification then punctuated by cursory training in MathLand. Amy addressed the issue of being prepared to teach earlier in this chapter by saying that less than 50% of the teachers were able to teach MathLand. There was a considerable amount of discrepancy voiced by teachers concerning the amount and types of training received. Prepared can also mean willing to teach. The data clearly showed that all teacher respondents were willing to teach MathLand. Brenda said, "when we would go to the training for those and we'd get one day and then we would want to be able to go in the next day and be the experts. We wanted it to work." Training discrepancies were not limited to the teachers; administrators received a variety of training experiences as well, none administrators stated that they attended the training for MathLand. Parents stated that training was limited to "math nights," where individual lessons were presented.

Another discovery was problems with homework. The artifacts and data collected reveal an absence of a traditional homework given in mathematics. MathLand parents and teachers struggled to come to terms with a variety of possible solutions to homework

problems given as log entries to MathLand students. Teachers told administrators that they were just staying ahead of the students when working out answers to questions similar to the sample artifact. Respondents mentioned that there was no textbook to fall back on to support student and parents with difficult homework assignments.

Coping with change was another issue uncovered by the respondents. Pressure, either perceived or real, played a part in the change process. Language changes exacerbated by preparation to teach and homework difficulties had a ripple effect on the school system.

One can choose a metaphor for the chain reaction of events that followed the poor training, homework problems, and the frustration that settled into the crevices created by the failure of the MathLand change to remain seamless. I believe that they are best described as ripples. These ripples become the consequence of the causes mentioned above. The following diagram illustrates the strong connections that can be made between the initial failure to communicate a grammar change and the cascade of events that rippled toward curriculum replacement. Evidence suggests that the failure of MathLand in DoDDS schools was not due to a singular event, but a rapid series of events that began with the language of math and ended with the replacement of MathLand by a curriculum of familiar grammar and tactics for teaching.

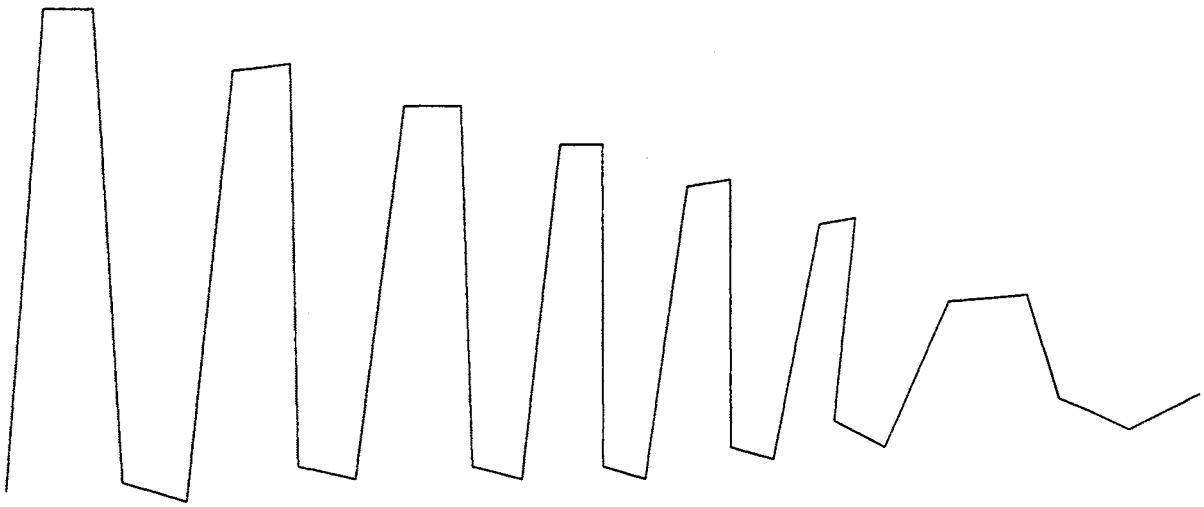

Figure 2: Connections Between Failure to Communicate a Language Change

The Language of Math

Core subjects like mathematics, science, social studies, and English give the school an educational culture. Part of the educational culture is the grammar of the school, a language that is rich in unique terms that identifies specific components of the school curriculum. These terms include textbook, study sheets, detention halls, and report cards. When people speak of the science curriculum, they think and speak in terms like dissection, test tubes, periodic table of elements, and chemical formulas. These tools form the grammar that is part of the culture of a school that teaches science. When we speak of elementary mathematics, we expound on addends, subtrahends, multiplication tables, manipulatives, homework, and textbooks. Parents identify curriculum by using this nostalgic language (Hargreaves, 2001).

MathLand replaced homework and multiplication tables with writing logs and tune-ups, word problems with Tic-Tac-Toe problems and individual repetitive calculation with group consensus on ten ways to make 45 cents from a combination of 8 coins. MathLand introduced these new terms, which replaced the old familiar terms. This constituted a grammar change, an assault on the familiar, a change in the language and culture of the mathematics curriculum. When a new curriculum is introduced, teachers are given enough training to reach the point of mastery. The training is in an area where each teacher is proficient, so at some point a teacher reaches the "got it" stage of the training. All teachers who taught MathLand received some training, yet the "got it" stage did not occur for many of them. This suggests that what was mistaken for poor training may have been a grammar problem. The grammar used to identify the names of the tools for teaching mathematics in DoDDS schools was changed, and the teachers were never taught the grammar for the new tools. Paul, a parent-teacher said,

> MathLand, from my point of view, seemed like a radically new approach. I thought it was radically different from the way I was taught. Numbers were missing. It just seemed so airy-fairy and concept based, I couldn't find any traditional math. My big fear was that people, if they didn't know math already they never would... learn multiplication, division, adding, subtracting.

Peter, another parent-teacher added,

> Trying to figure out how to do this stuff was difficult. Like I said, because it was so different from what we were used to. We saw a couple of videotapes that showed how these things worked but it was really in a very general sense. When you actually picked up your little purple book and looked at the lessons, it was

totally out of left field. You got a general idea that it was supposed to be different, but how that particular lesson really worked, we didn't have a clue. Joan said, "They had books from which you were supposed to practice, but some of the practice materials were very difficult to understand."

Linda, an administrator said:

I'm sure they did some pressuring upward asking for help. Asking help from the district offices, to DoDEA headquarters asking: 'help me help my teachers do a better job. Help me understand the program well enough myself to be able to support my community, support my teachers, support my students.'

Another administrator, Amy found, teachers unprepared for the challenges that the grammar change brought.

...the other thing that happened was that the teachers weren't very prepared for the implementation. There were a fair number of teachers, I would say better than 50%, who couldn't teach the program. They did not have the skills or the knowledge to be able to implement the program the way that it was designed.

Dennis summed up the events that followed the failure to adopt the grammar of MathLand.

It's all a—big domino thing... You feel like parents didn't have confidence in the teachers or the program and I think you saw it if you read any of the letters to the editor, the scathing letters about, 'Well what is this? Kids are playing with stuff without learning anything.' You know you had a wall built up already and you were never going to jump it.

Teacher Training

A cascade effect was set in motion that ended when new materials in the form of workbooks were introduced to the MathLand classrooms. Training problems shook the confidence of the classroom teachers; parents began to develop a growing dissatisfaction with MathLand. They began to question the competence of teachers. The teachers began to question their own ability to teach in the MathLand modality. Administrator expectations began to relax as the confidence in their teacher's ability levels came into question. Pressure to implement the program was profound. Evidence from interviews clearly points to an implementation deadline of the end of the first year. Dennis said:

> Oh, the pressure came from DoDDS, you know from my DSO at the time. I was in Spalding when it was being implemented. It was, "Hey, you got to get this done. I don't care what you had. This is what we say. It has to be done at this point. You must have this. You must have that." End of discussion! "Yes ma'am, thank you very much."

Some teachers believed that the training level was adequate to meet their needs. Other teachers, like Peter, were not so comfortable about the level of training that they received.

> I got a little bit of training on it and I thought, "Wow, this is what I'm looking for," and I took to it. I remember we did it the same way with the MathLand. We had a little bit of training and then it was on the job training. After about a month or two of the MathLand, many of us quietly closed our doors and, and went back to what we thought we should be teaching.

Patrick countered:

> I felt we had a lot of good training. It seemed like we had somewhere around six or seven days of training. The district math coordinator, if I remember it right, did most of the training. It was probably the most thorough implementation that I have experienced since coming to DoDDS.

Teachers who were less comfortable with training shared their feelings about the training issue. Linda said:

> Some of the problems were that many of the teachers who were already excited about the methods and the philosophy propounded by the MathLand approach were the ones who stepped forward from the beginning to say, "I want to learn more. I want to implement. I want to do this." They had the training as lead teachers. They were going to be implementing this first. Those who weren't necessarily interested in that approach didn't get as much training and time to process the approach and therefore weren't ready when it came.

Peter complained that some of his colleagues hit the ground running at the start of the school year but he was not really trained or ready, another teacher stated that it was different than his/her training and math teaching in particular.

> ...we had two maybe three lead teachers who went to the big MathLand seminar in the sky wherever it was, I don't know. And they were gung-ho MathLand people and, to be honest, it hit me out in left field. I had no idea that it was going to be that radical of a change.

They, the people who were implementing, our lead teachers, they said this was just great, and we all gave it our best. We all wanted to do well, we all thought, "This is

a very difficult program. In order for it to be successful we're going to have to really do well."

Linda took a different view of what training should be: intensive, shared, informed and confidence building. She focused on the training issue with an eye toward parent training.

Each teacher needs "meaning making." It doesn't matter that a lead teacher had had 10 days of training. A lead teacher getting 10 days of training and then condensing that into two days for a person that is not as excited about it does not work. Lead teachers should be given training in the materials so that they could go out and be ahead of the pack in trying it, so they could give advice and understand problems that might occur or questions that might occur. They should also be given staff development techniques to use with their colleagues, back at the ranch. They should be trained to be staff developers. The liaisons should have worked alongside them so that the individual classroom teacher did not get two days of secondhand training that was supposed to help them know what lead teachers got in firsthand training across 10 days....

Training for lead teachers not only in the materials but in staff development to support their colleagues, training all teachers—and enough training of all teachers—prior to being required to use the materials. We needed a pre-implementation year where they began to use as much or as little so they were comfortable by implementation year. Dennis, another administrator said:

> I think we should have implemented MathLand the way we're doing other implementations nowadays. We train teachers properly. We train teachers to be trainers. They come back and they train other staff members. They in turn train

other staff members. We bring parents in at this point. We train the parents. We educate the parents. There's a big one right there! We need to educate the parents. I had some people who were really, really into the MathLand stuff. They had worked with it, or things like it, so they really were good trainers. I probably was fortunate.

While Stephen focused on the importance of teacher and parent training.

Education of your populace is one of the big things. And then education of your teachers so that teachers will have everything they need to teach the program successfully.

Administrators encouraged classroom teachers to train parents with the hope that the same parents would become more comfortable with the MathLand program. Dennis began a campaign of parental education to ease the resistance by parents to the MathLand program in his school.

We did things like give some teachers, small groups of teachers, time off in the afternoons to hold parent meetings at the school. They would come in; we would do training with them. We would actually take them through lessons. We would have them pretend that they were a first grade kid. We would work with them. We would show them. We also went to wives' clubs. Once you get the wives hooked up, you're o.k. In fact, I did a presentation at commanders' meeting one time. We had a few admirals, we had blocks [manipulatives] around, and they had a ball so—. You should get them involved, you know, show them what your goals are. It's certain you're sure to get better buy in. I think we were lucky in

that we had some good people and we had a smaller community where people really listened to what we were doing.

I could see it just wasn't going to work with dumping the whole thing on us like they did. So we did take baby steps. We were a little more successful. We had a lot more parental buy-in because we worked with parents a lot more. But I think it was the situation we were in, too, because in Flagg we were the only show in town. We were the only elementary school, the only high school, so when we did something, we had parents show up. And they came to training, and we did a lot of that so we were a little more successful, but still not as successful as we should have been.

Unlike many others who were involved in this change, Dennis had a plan to successfully implement programs like MathLand. He believed that the key elements for success were parents and teachers.

...over a period of time, maybe a year or so, you have to make your choices. You do all this training and educating. You got to educate parents or you're not going to fly, and I think that was the biggest thing. And I think teachers felt betrayed in this whole situation. They were just told that they were going to do it; they didn't get training. They didn't buy-in to the program, and once you alienate the people who really have to teach the program, the program's dead. I think we're doing a much better job of implementing new things now because we get teachers involved a lot more in the first steps. Lack of training, lack of teacher training is always going to present new problems absolutely, and then lack of parental buy in because of that teacher training.

Another administrator, Amy, noted that parents were not the only people resisting the change in the math curriculum. The question was why?

> The teachers were really balking at implementing the program. It took me a while to understand that it wasn't the program. It was because they didn't have the mathematical skills and understanding to be able to implement the program. I don't think in-service would have... it might have helped. Certainly if the teachers didn't have the mathematical understanding to begin with, it would have taken more than a couple of workshops. I think that the programs that had happened before, you only needed to have a surface understanding of math to be able to teach it. You could teach rote processes in mathematics and be a fine, acceptable math teacher. The MathLand program required you to understand the philosophy and the meaning beneath all of the surface kinds of things.

Linda found that communicating the change to everyone was another piece of the training puzzle that was not found during the MathLand implementation.

> All parties concerned needed to have information up front and in digestible doses so that parents could know, "Here's a sample. Here's what's coming. Here's what it would look like. Here's why this is good for your student." The teachers needed the same thing. The administrators needed the same thing. There were people who understood the materials, the philosophy, all the concepts involved with MathLand, but they weren't the ones who were dealing with the student at home or dealing with the student in the classroom, or actually dealing with the materials that often. So, communication with all the parties is needed so there are no surprises about what it meant. That is a critical piece.

The schools that offered parental training enjoyed varying degrees of success. Sheri said:

> ...one good thing that they did do at the elementary level, they invited the parents in. They had Math Night so that you could fully understand the concepts of what was going to be taught. They also introduced us to the math sheets that were coming home in the evenings so that you could work together as a family. I really liked that some of the concepts that they had to come up with. They were different than the way I had learned to do math. But this took in everything.

I went to the different meetings they had in Okinawa, Japan. I attended different parent forums. I went because there was a big uproar. Because all of the sudden, the textbooks were taken from the kids, and they were told, "You don't have to memorize this," or, "We're using these little squares," or whatever.

Training had different meanings to different interviewees depending on their position. Not all administrators were aware of how different MathLand was from the traditional mathematics curriculum. This resulted in varying levels of teacher training and staff development devoted to the MathLand program. Joan said:

> We had two maybe three lead teachers who went to the big MathLand seminar in the sky wherever it was, I don't know. They were gung ho MathLand people and to be honest it hit me out in left field. I had no idea that it was going to be that radical of a change. We had so many people who were lead teachers I think jumped into it on the pre-implementation year. I think it was, that's the way it was done. To my recollection, as soon as we heard about it we were doing it that

same year. I assumed that was a pre-implementation year. It was not a pre-implementation year.

Not all teachers felt comfortable with the change and not all teachers were prepared to teach the MathLand curriculum. Additional stress was placed on lead teachers to support the program, teach the MathLand curriculum, and support colleagues who were not prepared for the radical change MathLand brought.

Parents were not initially aware that a significant change in the grammar of the mathematics curriculum had occurred. Many were solicited to attend Math Nights after the implementation was underway. Parental education was a knee-jerk reaction that districts gave to the mixed reception given to the new MathLand curriculum. This lack of training will set the stage for the events that followed. Amy indicated how administrators and teachers worked together in Math Night training programs to get parents involved. She said:

> The administrative response was to then bring in the math coordinator and do some math nights. They were well attended, there were lots of parents that came out for the parent nights and they [teachers] did sample problems with them and, you know, explained the strategies. But understanding the program didn't change what the parents' concern was, and that was that the kid was getting a low grade in math and they wanted to be able to help them, but they couldn't.

Homework Difficulties

Parents voiced concern about the homework situation. They admitted to frustration and high anxiety about homework issues. One parent noticed a change in the

homework just before Terra Nova testing time. (Terra Nova is a bank of test items developed by CTB McGraw Hill to replace the TCAP [Tennessee Comprehensive Assessment Program] achievement tests administered to Tennessee students' grades 3-8 in the spring of each year.) The Department of Defense recognizes and uses these standardized tests each year. One parent, Sheri, noticed a change in teaching when testing time approached

When it got closer to Terra Nova time, they actually went back to the old way of teaching. They would hand out the traditional type worksheets and the traditional types of homework. Parents would have to help them at home with basic things that typically they should have been learning all year, but didn't because they were working with these other little tiles and things.

It was clear that frustration with homework was a serious problem for parents. Sue and her daughter had difficulty doing all of the math problems for homework

> In MathLand, I found that the homework that my daughter brought home, the worksheets, were basically logic problems. I, we, could do two to three of them, but never all four of the problems that were on the paper. I couldn't work them out. There were different procedures that they were probably taught in class, I don't know. I wasn't in the classroom, but (pause)—the difference is that there was no...structure.

Another parent, Maureen, stated

> As far as homework level, a plus is that I think the parents ended up getting a little bit more involved with the math. Sometimes the kids would get stuck and they didn't know how to do the reasoning, and didn't know how to do the critical

thinking. So that was a plus that the parents got involved but I think the minus is— that it did take a little bit more time.

Yet another parent, Marj, expressed helplessness about knowing what was being taught and assisting the learning process.

I never saw any homework, so that goes back to the exercising and practicing really. It was very difficult to pinpoint what the kids were actually working on. I don't really see that I could support it in any way because I knew hardly anything about it.

While a different parent, Dick, was concerned about teaching problem solving skills at the expense of basic math computation skills.

I liked the idea of teaching concepts and process, but my son seemed to need additional support in math functions—multiplication tables, division tables. Knowing the concept of multiplication is one thing, having the multiplication tables memorized through 12 is another. We ran a lot of exercises at home; we had all the basic math facts readily available.

A parent-teacher, Sheri, took a different view of the homework situation. She focused on traditional math homework as the yardstick by which MathLand homework was measured. Additionally, supplemental practice and instruction was provided in the home. Not just by one parent, but by other parents as well.

Traditional homework was absent in the MathLand curriculum. Jenny can multiply because at home I made her memorize the multiplication tables. Most of my friends did the same with their own kids because, as parents, we realized that they have to have these down. I think the problem solving part of MathLand was cool. I did like that.

But you also have to have basics offered. You didn't get them with MathLand. She initially had a good start, and then they swapped programs on her. When they swapped programs and she's told, "Oh, you don't have to do it that way, you're doing it this other thing...." She hates math now, she struggles with it and she was a student that did very well at first.

Some parents enjoyed the challenge that MathLand homework provided. A parent-administrator, Stephen, explained.

> My daughter would say, "No, no, no dad, that's not the way you do things. This is the way you do it," and I'm thinking, "O.k., great. That's fine." And then, sometimes you couldn't get me into it. In the old system that I was under, you had to have the right answer. But in MathLand, some of those sheets that we got, you could come up with answers four or five different ways and they would be o.k. So it was the concepts they wanted the children to get more than anything else.

Linda, an administrator, saw a distinct difference in homework given during the MathLand implementation. She saw the effects resulting from the lack of traditional materials and difficulty with helping students at home. "...[MathLand] wasn't going to have a traditional textbook with traditional homework and workbooks that have been the way learning math has taken place in the past."

Then they were facing parents who didn't understand or may not have approved of the approach and materials, saying, "I don't like this. I want homework to come home. I want supplementary workbooks. I want information that I can personally

understand how to help my student." And MathLand didn't have those so as they became more concerned and more verbal.

Another administrator, Stephen, said:

> They [MathLand students] didn't bring home a textbook, whereas when I was growing up I had a textbook and everybody had a textbook. You had to bring that puppy home and then you had to work out the problem, but it [MathLand] was more hands on. They [MathLand students] worked as a group to solve problems in a classroom, which was great. That was fine. Then they also did the worksheet where the parents got involved. Usually my parents got involved with it when I didn't know how to get the answer to the problem. I remember two things. We had numerous toothpicks and we had to put them into all these designs and then come up—"O.K., yeah, you got this design. How did you do that?" Then you had to explain how you did that. So you had to think. So that was thinking skills that I noticed whereas the old way, there were word problems. You had to figure out whether you were going to do multiplication, are you going to divide, are you going to add, or are you going to subtract?

Administrators knew early on that the lack of a textbook and support materials were going to contribute to homework problems. Parents reacted angrily to the lack of textbook support and the difficulty with MathLand problems. Some took matters into their own hands and began to teach traditional math calculations, multiplication drills, and other traditional math in the home. Parents supported a mathematics education for their children in a language that they clearly understood. It should be noted that parents

were supporting a mathematics curriculum; but many were not supporting the one being taught by DoDDS.

Code of Silence

Parent-teachers offer a unique insight into the change process. Their perspective on change in the classroom is tethered to both sides of the desk. Their view of curricular change can be likened to that of a stockbroker with insider trading information. They also are bound to some extent by a similar code of silence. They are experienced and talented educators. Paul, a parent teacher said:

> I go back and forth between being a parent and a teacher. It's sort of hard to keep the two separate sometimes. I did talk to people that I thought were smarter than I was about math, notably high school math teachers, and they had a few fears. I knew there were people who were much more opposed to it than I was. You get caught in that teacher thing. You don't want to be leading a parent charge against something the school does while you're working for the school. But at the same time, you need to be a parent. You need to look out for your kid. In retrospect I probably would have complained a little more had I known. Had I not been a teacher, well that, that's the case with a lot of things. Had I not been a teacher, I think I would have been in there with a lot to say.

One parent-teacher stated that his heart was not in it, but he continued to teach parts of the MathLand curriculum and supplemented it with bits and pieces of the old curriculum

> It was a hard sell to parents, so consequently I would say that after the first or second month we started to supplement it with traditional math materials when the doors were closed. Going back to what we knew best and what the parents expected. So we basically flushed it pretty quickly. But I would only say that now. I would never have admitted that earlier.

Another teacher admitted to having a difficult time understanding the MathLand program and supplemented it with older curriculum materials

> Some of the teachers did not understand it. I never received a teachers' manual to help me get answers and some problems you could have several kinds of answers so I had a difficult time giving those practice books to the children because they were difficult. I think when you work with little children you need something easy first and then you build on that to more difficult things. But they were, a lot of them were very difficult. MathLand was a total departure from the regular teaching style, and teaching methods that we were all accustomed to with teaching math.

Parent-Administrators are similar to parent-teachers in that they are bound by the same insider trading knowledge as a stockbroker or a parent-teacher, but at a much higher level. As educational leaders, they too are bound by the ethics of a silence that shelters any organization during periods of crisis. The parent-administrator also shared the parental concern verses the institution needs when it came to voicing concerns about the MathLand program. A parent-administrator pleaded guilty to complicity with teachers

> I think we just followed the MathLand program that was presented at the school we attended. I am not sure that everyone presented the MathLand program in the same way, but ...we knew that we needed to have some concrete math functions. In fourth grade, we bought an additional book besides what DoDDS was using, a Saxon math textbook, and he (our son) worked through the whole thing. Saxon math seems to have a little bit different approach than MathLand. It didn't teach the process, but it emphasized getting the right answer.

It was clear when the ripple reached the edge of the MathLand puddle, it did not crash loudly on the shore, and instead it slid quietly to a stop. For administrators, managing the change from MathLand back to a more traditional mathematics curriculum took far less effort. One administrator observed

> The new [math] materials were far more traditional than the MathLand materials, so there was a comfort level for many teachers. Whether they believed in that approach or not, they knew how to use the older style materials even if they believed in the MathLand approach. Teachers who had never been fully comfortable with the MathLand approach now had materials that were more in keeping with what they'd been trained to use and what they had used previously. So there was not a need for the training, there was not a need for the communication to parents, there was not a need for a radical PR [public relations] campaign or training campaign because it looked like what people had had prior to MathLand in many ways. Prior to MathLand people were using manipulatives. We knew hands-on was important, but there was more of the hands-on and/or higher level thinking in MathLand. I think people found a comfort zone with the

> new materials, which meant they didn't feel the need for all the training, or of all the communication, or all the reassurance. This was the right way to go this was needed during MathLand and that's for parents, staff and probably administrators, because if staff isn't complaining and parents aren't complaining then administrators are obviously happy. They have plenty to do so if there aren't any complaints coming, then they're going to be happy to let it be that way.

Coping With Change

Coping is a nonspecific reaction to an untenable situation. In the case of MathLand, however, each group reacted rather than responded to the changes brought on by the new language of MathLand. This coping was a specific reaction to poor training and poor communication during the implementation of MathLand. The reactions of teachers, parents, and administrators were directed at coping strategies, which would enable them to survive MathLand but not to repair it.

Coping with institutional change is a challenge in the best of times. Coping under the stress of being challenged at every step of a radical or complete change is even more demanding. Coping tactics help to make change more palatable and can reduce anxiety. Joan, a teacher, said:

> I didn't feel pressure from my administration because they were supportive, and I also had my own math materials, which they did not say we couldn't use. So I did use math materials. Some places were told, some schools were told that they could not, and they collected their math, old math materials and they were thrown away, but I still had math materials from the series before.

Linda, an administrator found a reference point for future situations involving curriculum introduction.

> Those activities that would prepare the parents for the dramatic change weren't always done. I don't think people predicted the concern parents would have about not having a math book. And so, with hindsight it's, of course, easy to say it would have been helpful to do that ahead of time.

Angst was handled differently at the teacher level where the change was implemented. One teacher, Patrick said:

> Most of them [teachers] did not like it and were not happy with it and were vocal about it. Looking back on things, if they had just kept quiet and accepted it like they do most things, and then gone about their own business of choosing resources and materials that they feel best suit them I think it would have been a little bit easier. But people were so up in arms about this new program; it generated a lot of conversations.

He maintained a sustained effort to implement the program for more than two years before collaborating with another teacher to ease his burden.

> After about two and a half years of working with MathLand and getting frustrated, I had the kids using fraction circles. They could do them backwards and forwards, they could make equivalent fractions with fraction circles and being able to reduce with fraction circles, but when you would give them a paper and a pencil and a problem they did not know what to do. I was frustrated, and I remember talking to a fourth grade teacher whose name escapes me at the moment, she taught in Germany and was a wonderful teacher and then she taught

here in Grove for one or two years, my son was in her class. I was talking to her one day and she said, "Look, we have to use MathLand, so use MathLand, but instead of hoping that the kids meet the right goal or conclusion, why don't you start with the skill or concept you want them to know and tell them. Tell them heads up, this is what you're going to be able to do. You're going to be able to reduce fractions or you're going to be able to make equivalent fractions: show that 1/2 = 2/4 = 4/8, etc. And show them how to do it with paper and pencil, and then go back and do the manipulatives." And I tried that and it was much, more effective.

Another teacher, Peter, was more philosophical about his own personal approach to coping with change.

Well, it was a radical change. It was totally different than anything that was within my experience. Like I just mentioned the new health and social studies curriculums they're pretty much generic programs. You see slight differences in them and you think, "Oh, I like this," or "I don't like that," and you adjust and adapt.

The interviews showed that the perspective changed with the responsibilities that the individual interviewees had during the change process. The change process meant different things to different participants. Parents, teachers, and administrators viewed change with a different list of expectations, and with different knowledge about how the change process should look. The influence of perspective plays a vital role in the attitudes and expectations that each of the interviewees had about MathLand and the change process that occurred when the new curriculum was introduced to the Department

of Defense Schools. Perspectives, concerns, considerations, and expectations were different for each of the respondents. Parents expected student's grades to improve in mathematics; they expected a steady flow of traditional (basic) mathematics homework. Parents expected the math to be different, but familiar. What they got was an unfamiliar mathematics program with no textbook, and no support.

Same here...Teachers expected a reduced workload because homework was not encouraged and textbooks were nonexistent. Administrators expected a smooth transition for the old mathematics curriculum to the MathLand curriculum. A modest training program was put into place designed around a limited number of lead teachers that would be trained during a 7 to 10 day intensive program. The perception was that these teachers would return to his or her respective schools and help other teachers to implement the program following a 2 or 3 day workshop at the beginning of the school year. The fact that some teachers were not prepared was not factored into the training plan by administrators above the school level.

There were 16 people interviewed about MathLand. Some respondents were interviewed in dual roles of parent-teacher or parent-administrator. All have children currently enrolled in the Department of Defense School system. The following statements taken from interviews provide an insight into the perceptions, feelings, and actions taken by parents, teachers, and administrators. Ed, a parent, made the following observation about MathLand and his son.

> The way I was taught math was by repetition. By the times [multiplication] tables and I think it was a better way to teach than MathLand. The way that I looked at

it was that it was too experimental. I believe my kid was being used as an experimental case.

What I'm talking about is the basics to build on, the building blocks of math. When you learn English or spelling, one of the things you learn first is your ABC's. And I believe that the times tables are one of the building blocks up to higher math. That's the simplest way I can explain it. Well, we always supported what was taught at the time, but my wife and I looked at it and we felt that it wasn't traditional. It wasn't what we were taught in the past. We both had open minds, but this was totally off the wall (laughter).

Another parent, Marj, said,

It was something the teacher said, "O.k., we're doing this. This is great, this is wonderful." Basically, as far as I'm concerned, we were left out in the cold. It was something that was announced or talked about, but I can't remember what exactly the occasion was. I remember questioning that along with a lot of other things that were going on at the same time. Well, it seemed to be just the idea of it being so experimental. That really scared me because I figured, if it's not working, my child lost out. He was the guinea pig.

Another parent was happy about her daughter's teachers working from the old materials. The teacher kept aside old materials and taught a mixed curriculum. The parent interviewed was not unhappy about the modification.

I can tell you that there were still some of the teachers with the old hats [experienced] that kept some of the other things aside. One of my daughter's

teachers did keep materials from the old programs, so Katy was able to get basic teaching. So she was being taught the real thing, not just MathLand.

Marj found one teacher who clung to the wreckage even when MathLand was on the way out by continuing to promote the MathLand program in the face of her concern and opposition.

> They [teachers] downplayed my concerns, they were very positive. "This is very innovative." And, you know one time I got a teacher who said, "Well, you know, we have to teach it. We don't really have a choice." I remember one teacher saying, "Yeah, but with these word problems, this really applies to the real world, to everyday problems."
>
> I was taught the traditional way with drill. You know the basics that you had to drill over and over to make sure that kids had them down pat. It [MathLand] seemed to lack that. They said, "Well, these word problems apply more to real life." I think it left out all the good old-fashioned teaching methods, the time proven methods. It seemed to leave all of that out. It's the basics and just the time proven methods. MathLand just seemed to totally disregard them and that's what's scary.

Maureen was sold on the idea of MathLand because it appealed to her vision of what her child's education should be. Not all findings were negative

> They [teachers] talked to the parents, brought the parents in, and sent out a letter asking them to come to the meeting. So we went to the meeting, and it was so close to the Montessori—my daughter had been taught a Montessori method. We were just thrilled because we thought it was going to really help her and enable

her to do well in math. And it has, because she did it for two years and then she had the Montessori program, so she's doing really well.

The only part is that it [MathLand] did take a lot of extra work, I think, for the teachers, because I was a substitute. When I would go in as a substitute, your thinking had to change when you turned around and tried to teach MathLand. As in the sheets that my daughter was bringing home, they had different coins because they were learning about coins. They were learning about how many coins equal up to, let's say, 43 cents. I think in that way you bring the parents in and it just took a little more time to help them do the critical thinking part of it. I didn't have any concerns with the program because I really liked it.

Problems are rarely brought to the forefront by happy parents. Parents who were unhappy with the program quickly formed a coalition to make a change back to a more traditional form of math. These coalitions identified exactly where to apply pressure and did. Sue, a parent described how pressure was applied to an individual administrator

The parents were the ones that brought it up because the SILT committee also had an administrator in there with them. So the parents are the ones, not just the math committee, the parents are the ones that brought it up in one of our meetings, several of our meetings. Actually, we did discuss it. I firmly believe that's part of why MathLand got taken out of the curriculum.

I know one of them [problems] was the fact that they didn't have a book that the parents could see. That they were not being taught [math] like we were taught math. That was one of the main concerns. Of course, I know that it had to do with change. I know you can go through some changes, but once you've gone

through a change and you realize that this isn't actually working [pause]... that's what was making the parents upset. "This isn't working for my kid. We need to make a change. Find out what's going on." That was the main concern. I can't recall all of the concerns, but I do know the main concern was there was no book that they could follow. The concern was they [parents] didn't know what to help the child with.

I spoke to the principal of the school, the chair of the SILT (School Improvement Leadership Team) committee, and then the NCA. We had our inspection the year I was there, so the NCA got to hear about it as well. I was a SILT committee member and I was introduced to the NCA. Parents were also invited to forums to speak with the NCA as well. I also spoke to the NCA as a parent not as a SILT committee member. The NCA would go up and ask, "What is your perception of this or that?" And parents brought it up to them. We had parents on the SILT committees that got a group of parents to come in and specifically speak about MathLand and other issues, so I know the NCA was told about what we thought of MathLand.

We took it upon ourselves, the SILT committee parents, to ask other parents if they wanted to do this with us [speak to the NCA team about MathLand] and we had a few other parents do that. We voiced it [concerns about MathLand] with the NCA. We knew the parents of the SILT who had already voiced it to the principal and the SILT committee. So the parents that had similar views then spoke to the NCA. I don't know that they ever met with the principal or met with the SILT committee in an arranged meeting.

> I'm glad that it's out. I feel that my child is now being taught from a math curriculum with a structured book, workbook, worksheets, work pages, whatever. When she brings home her book, if I don't understand what she's got on the worksheet, then I can actually read the book as well. I could help her.

The threshold of saturation or level of frustration was different for many teachers. For Joan it was not long before she trotted out the old materials and abandoned MathLand in favor of the old math curriculum. It allowed her to teach in a familiar grammar and style. Joan was able to cope by teaching in her comfort zone with materials taken from the old curriculum.

Teachers were also taken back by the lengths that parents would go to in order to assault the proposed curriculum implementation. Peter, an elementary school teacher found one mother who did her own homework. He said:

> This mother whose husband was a doctor was very vocal. She borrowed my MathLand materials for the summer and she researched MathLand and wrote a report on her findings. The only thing I remember was that she pointed out that there were no mathematicians as authors in the MathLand series. I thought that was a real interesting point. She was furious about the whole thing.

Administrators were not immune from the MathLand fallout. They felt pressure from several directions during the implementation process. They were asking for help in dealing with troubled and sometimes angry parents and teachers who were struggling with the new curriculum. Linda was able to nicely articulate the difficulties faced during the transition into the implementation phase of MathLand.

The administrator of course would feel pressured to defend the MathLand approach to parents. I know the administrators felt pressure from their staff for help in making change, for helping parents understand it, for helping them feel competent and confident in using the materials. So I know administrators felt pressures on all sides.

Pressure may not be the correct term. I'm sure that they felt obligated to assist teachers, to point out to teachers that the adopted materials, the adopted curriculum, the adopted philosophy from DoDEA was indeed what they were supposed to be using. I'm sure they pressured their teachers—and I, again, am not sure pressured is the correct term (long pause). But I'm sure they were feeling that they needed to encourage and support teachers to follow through on what their bosses said the curriculum was.

Another administrator, Amy, focused on parent concerns with the program and homework

It was real important to have parent meetings right at the beginning because there was quite a bit of parent backlash. They didn't like the program. It started within a couple of months because the students didn't have a book to take home and have math problems every night. The parents started to get upset, so they started parent meetings. That probably should have happened before the program started, but instead they started to take place as a result of parent concerns

The teachers were getting lots of comments from parents and—disgruntled notes. They would call after the midterm and say, 'Why has Johnny got such a poor grade and how can I help him?' And then it just kind of snowballed and the parents weren't getting

satisfaction. So the administrative response was to bring in the math coordinator and do some math nights. They were well attended. I mean, there were lots of parents that came out for the parent nights and they did sample problems with them and, you know, explained the strategies. But understanding the program did not change what the parents' concern was, and that was that the kid was getting a low grade in math and they wanted to be able to help them, but they could not.

There were some parents who did not like the program at all because it deviated from the old way that they learned math. So, you did have some parental groups who eventually petitioned DoDDS and they had their various groups in various locales. I never attended any of those meetings, but they had the right to do that. Eventually they got a new program.

Why were teachers balking at the opportunity to implement a new and innovative program? One administrator offered two very surprising reasons

> I did a lot more observation of teachers because it took me a while to figure out why there was so much resistance on the part of the teachers. Some teachers jumped in right away and were using the program, and other teachers, even after half a year or a year still were very marginally implementing the program. And also when the program first came out at the middle school, teachers didn't have the answer book or whatever you want to call it. They had all the problems, in there, but they didn't have the answer book. That wasn't provided. I found out when one of the teachers just said, "Well, gees, I'm spending all this time just working out all these problems myself, you know, ahead of time." And come to find out, for ten dollars there was a little key that DoDDS hadn't ordered.

Teachers were working out problems just ahead of the students because they were not aware that they could have an answer book. They continued to work out the answers to the MathLand questions at the expense of lesson planning and other supportive duties. It was clear when trouble began with parents. One administrator said it happened at grade time.

> Well, I think that, when the grades started coming out and the kids had very low grades. Because the kids, who had been number crunchers, you know, A/B students who had just gotten the answers and didn't understand it, all of the sudden had to do problem solving. So, you'd have a student that went from being an A/B student to being a C/D student. When those first grades came out at the mid-term and then at the end of the first quarter, the parents would say, 'I want to help my kid. Give me something to help the kid. And they [teachers] said, 'No, there's nothing that you can do.' That's where the opposition came. They were trying to fight to help their kids and they weren't given any help or support. So one of the things that DoDDS ended up doing then was ordering books that had addition, subtraction, multiplication, and division in them so that the kids could take those home and practice basic skills while still implementing the MathLand program to help parents with that.

The other thing that happened is, after the first year, and you looked at the standardized test scores, the scores in math went way down. Well, because the program was so geared to problem solving, all of the calculation kinds of skills dropped off and on the standardized test there's a lot of—not problem solving, but calculation kinds of things and the kids were low on it. So it really needed to be a balanced program.

Untrained and uninformed principals and teachers had trouble explaining and defending the program to angry and confused parents. What did this look like from the perspective of an administrator?

The administrator himself or herself may not have been fully trained enough with the vocabulary and with the concepts to be able to explain it thoroughly to the parents. Then teachers who were not trained or who did not feel as well prepared or trained to implement the new materials and approach also let their administrators know their own frustrations or concerns with how it was working in their individual classrooms.

Administrators did have an understanding of the difficulties teachers were having and some were sympathetic to their staff

> I knew teachers were frustrated with it. I would try to work with teachers and try to relieve as many of their anxieties as I could and try to work together. My style of administrating is kind of like, if you notice my whole building is gray on the interior. That's kind of how I operate: in the gray area, you know. I'll take what the boss says to do and if I don't quite agree with it I will do just enough to make sure that it doesn't come down on my neck. That's what I did with MathLand.

The teachers had still another view of the introduction to MathLand. Even skilled math teachers were a bit unsteady on their feet. Sarah reflected on the events

> I don't remember that we were aware of the materials that had been bought to support the curriculum... there were a lot of good ideas, and the whole way of teaching math changed at that time. For about the first year or two we pretty much floundered because we had bits and pieces instead of anything that had a complete sequence to it. I know that, at the time a lot of teachers were so

uncomfortable with it that they went ahead and continued to do a lot of their own types of things. But I tried to follow through with it and do it the way that I understood it was supposed to be done.

... the MathLand program itself, I don't know that I could have made that program more successful. There wasn't a textbook, which concerned a lot of parents. Also, the parents weren't aware of what kinds of activities were going on in the classroom because the child didn't bring home anything tangible such as a worksheet or any kind of daily work. Maybe the most outstanding math teacher could have made the program successful and could have filtered in some things like that, but the program, as it stood, didn't allow the parents opportunity to influence their child and to help their child at home. I tried to follow it. It was done with a script and 'you read this and they do this, and I tried to follow it as closely as possible. Was self teaching the answer? One teacher tried that and other strategies as well.

First of all I read a lot about the theories—you know, the basis of the program and what it was supposed to offer the students. I tried a lot of the different things in the classroom, you learn by trial and error. So you are able to do differently the next time. I did a lot to teach myself about the program.

I think it was a lot of strategies, a lot of experimentation, being able to take risks, and to try new things. It was difficult to learn to be a facilitator; you had to practice learning being the facilitator and not the teacher. You had to learn to be a better listener. There were a lot of things you just had to practice and try out

and dare to be a risk taker and let yourself, you had to learn to be happy with the good things but you had to accept your mistakes.

...and parent evenings, you know we did parent evenings. I worked to really promote the program with my parents. I did a lot of parent communication in newsletters. I tried to let parents know I'd send out some of the family letters that explained the program.

Top Down

Sarason (1996) noted the tribulations that educators faced when they implemented change from the top down. Sarason indicated that the change desired would be adapted to meet local requirements. There is strong evidence that administrators (including curriculum coordinators) above school level, and at school level wrestled with these issues brought on board along with the MathLand program.

Administrators making the decision to completely change the mathematics curriculum failed to identify the change in the language of math as a problem. They failed to educate staff and parents and they applied pressure to expedite the implementation. They guessed, incorrectly, that the implementation of this mathematics program was similar to any other math implementation and they ignored the lessons that other school systems had already learned from the MathLand experience.

One administrator said that the evidence was already clear before the MathLand curriculum was introduced

I think that somehow the coordinator level should have had a better handle on what the actual skill level of the classroom teachers was. And waiting for the

> parents to become disgruntled, before they had the parent meeting. When [they knew that] programs like this had been implemented in other parts of the country and they'd run into the same opposition. So it seemed to me that they should have learned from that. I think California was a prime example, so that information was out there, and then for us to go into it as if we were blind—I really wonder about an implementation when you have that information available.

Another administrator admitted to a surge of pressure:

> The pressure from DoDEA was, 'this is our adopted set of materials, in line with the adopted curriculum approach for our system, and we would expect you to assist in making this a success in your school.

Lead teachers were expected to present the MathLand and not just to students and parents. In addition to training teachers in the methodology, lead teachers were expected to carry out a hard sell to other teachers as well. Administrators believed that the training given to lead teachers would be enough to assure the success of the implementation. Not all teachers were receptive to the idea of a big change with minimal training.

> Because we had so many people who were lead teachers, I think jumped into it on the pre-implementation year. I think that's the way it was done. To my recollection, as soon as we heard about it we were doing it that same year. I assume that was a pre-implementation year. It was not a pre-implementation year. We went right into it.

One administrator detailed the problems introduced but not overcome.

> I can tell you that it was poorly implemented. And it had a number of problems. First of all I think it was a top down decision. There wasn't much in the way of

from the grass roots level on how it was to be implemented. I think that we had a lot of people involved in the selection of the program but when it came to the implementation they just kind of said, 'Here it is... You're doing it.' That was bad, and it caused a lot of problems, mostly because there wasn't any communication or very little communication from the top down. And that's kind of basically how I feel about the whole thing.

I was an administrator; I had to do it! I probably was in a different role than other people. You probably need to ask other administrators but as an administrator at an elementary school. I had to have it implemented. That was my job to make sure it got implemented. I didn't agree with what they were doing. I didn't like how it was implemented, but I felt the pressure in that I had to get it out there. And so, yeah, there was pressure, and I know my teachers felt pressure, and parents were just puzzled so— the pressure came from DoDDS. From my DSO (District Superintendent's Office for a region or district) at the time I was in Med. District (Mediterranean District) when it was being implemented, and so it was, 'Hey, you got to get this done. I don't care what you had.' This is what we say. 'It has to be done at this point. You must have this. You must have that.' End of discussion. 'Yes ma'am, thank you very much.'

Teachers recognized the pressure to jump on the MathLand bandwagon. A timetable was spoken to them and their mission became clear during the brief training sessions.

The first year you had to use, you had to use it 30% of the time and the second year you should have used the entire program exclusively. However, I've only

experienced the language arts implementation and then the math program that replaced MathLand.

We were pressured. The initial reaction to MathLand by most teachers was negative. They did not like it. It felt like, as a response to that, administration at all levels became more and more adamant that we would use MathLand. The district coordinator was quite firm during the training that we would use MathLand. Some teachers of course went back to their rooms and said, "No, I wouldn't." And I remember Sue, who was my principal at that time at Grove Elementary School, as just coming right out and saying, 'Yes, you will. By the second year everybody WILL be using MathLand 100%.' I don't remember exactly, but think that there was also something from the superintendent saying that we would use MathLand 100%. I believe this pressure had been generated because of the response that teachers gave towards MathLand.

The data from the interviews clearly showed that at the time that the supplemental materials were introduced, everyone from administrators to parents clearly understood that the attempt at MathLand had failed. Some suggested that it was unpopular among parents and teachers. The truth about why if failed eluded the casual observer. One thing was clear, when the end came for MathLand; no one was fighting to keep the change alive. It slipped out of the mathematics classrooms overnight and in a matter of days no one was using the MathLand materials.

Summary

The interviews have indicted that the ripple effect brought on by a grammar change as a cause for the demise of the MathLand curriculum in the Department of Defense Schools. These interviews have provided evidence that the introduction of MathLand was the single act that changed the grammar of the mathematics program in the DoDDS school system.

From the interviews, there emerged recurring themes. The themes were subtle but eventually found their way into the dialogue of each interview. Those themes were identified as teacher training, difficulty with homework, and a sense of being lost and being confused by the program. This confusion was not limited to parents teacher fell victim to homework problems as well. Teachers found it difficult to assess the progress and work of the students. At times, teachers found it difficult to defend grades, experimental teaching, failure of students to develop fundamental mathematics skills and difficulty with the homework for both parents and teachers. Parents and teachers felt helpless about making any type of change in the curriculum

The data revealed the failure to educate staff and parents in the genre of MathLand. These events began with training issues for teachers. Lead teachers were given several days of training and other teachers only two or three days administered by the lead teachers and curriculum coordinators. Administrators were not trained or poorly trained in MathLand and had difficulty explaining it to parents. Parents experienced problems with homework solutions and the absence of traditional materials such as textbooks, workbooks, basic computation skills, and homework assignments. Teachers had difficulty with concepts and presentation. Parents and administrators lost confidence

in the teaching staff and parents pressured administrators and above school administrators for change.

Above school level and administrative pressure to implement MathLand quickly led to a culmination marked by regression to a previously accepted type of mathematics curriculum laced with manipulatives. The supplemental materials had all the trappings of the old but familiar mathematics: a textbook, workbook, fundamental calculation problems, and homework that parents recognized. The supplemental materials quickly became the math curriculum.

Chapter V focuses on the analysis of the data presented in this chapter through the lens of change in the language of mathematics and promotes the notion that a language change resulted in an unacceptable culture change in the DoDDS mathematics curriculum. Creating the ability for parents to assist with homework and enabling parents to work comfortably in familiar territory resulted in change from the unfamiliar to the familiar. Teachers returned to their comfort zone for teaching. They returned to a language they clearly understood, grades were easier to calculate and defend, and administrators were able to evaluate the progress of students being taught in the language of a familiar mathematics curriculum. Chapter V emphasizes the powerful role that language plays when introducing a radically different program such as MathLand.

CHAPTER V

DATA ANALYSIS

The domains identified in Ripple Effect discussed in Chapter IV are further refined through the analytical lens of grammar as described in Tyack and Cuban (1995). The data was cast against the notion of grammar in order to discover the aspects of a grammar change, which preceded a culture change in the mathematics of the Department of Defense Schools.

Data analysis indicated that three of the MathLand teachers strayed from the curriculum during the implementation. Three of the teachers interviewed admitted to deliberate deviations when the classroom door was closed. Only one teacher, Sarah, was prepared to teach the MathLand program without further training. Three teachers admitted that the curriculum was difficult to teach as designed. Not one teacher or administrator stated that the quality of the MathLand program was suspect. Five of the administrators interviewed made allowances for the teachers not teaching the prescribed curriculum. Eight of the parents interviewed expressed some degree of displeasure with the MathLand curriculum during the attempted implementation.

This study focused on "grammar" as an element that transcends the myriad of causes related to curriculum failure. Support from administrators, teachers, and parents is essential for the success of curricular change. Gaining that support requires an understanding of what the change entails. In this study, which charts the course of the

change from traditional teaching of math to the inception through to the demise of MathLand, it was a language change, a change in grammar. This notion of grammar is summarized by Tyack and Cuban (1995). They found that an introduction of any radically new curriculum into a school system challenges the grammar of the school.

Failure to educate parents in the language of a radically new curriculum like MathLand left them to grapple with the language change on their own. The assumption by school administrators was that each group parents, teachers, and school level administrators would adjust to the change. This assumption that parents, teachers, and administrators were ready and willing to accept change without a lesson in the new grammar remained unresolved.

The act of changing teaching practices and the omission of parents from the pre-implementation process combining to form an uneasy but highly influential political coalition between parents and teachers has often contributed to the demise of new curriculums (Tyack & Cuban, 1995). Evidence uncovered during the interview process revealed a similar pattern in the processes surrounding MathLand and its implementation. Parents quickly factored into the demise of the MathLand curriculum. This chapter will establish the role that grammar played in changing the culture of DoDDS schools by changing the grammar of mathematics. The chapter will examine grammar, changing language and school culture, MathLand failure and curricular change. It will examine the thoughts and responses that the interviewees had during the implementation process.

Changing Language and School Culture

Tyack and Cuban (1995) define grammar as, "Practices such as age-graded classrooms structure schools in a manner analogous to the way grammar organizes meaning in verbal communication... Indeed much of the grammar of schooling has become taken for granted as just the way schools are" (p. 85). Grammar in this sense might be thought of as both descriptive (the way things are) and prescriptive (the way things ought to be)" (Tyack & Cuban, 1995, p.165).

The essence here is that parents, teachers and administrators believed that a radically different curriculum like MathLand would be able to bridge the gap between the descriptive and prescriptive. They expected the new curriculum to look like and work like the old curriculum. MathLand could not do that. No one could accurately describe it descriptively in terms of grammar, so there was no way of prescribing it to fit the old way of teaching math.

Wren (1999) makes a connection to culture and what is referenced to as a hidden curriculum. Hidden curriculum is an existing culture found in the school, it is the unwritten aspects of the school's grammar that everyone understands. Wren cautions those who mean to make change and ignore this hidden curriculum. "Educators need to be aware of the symbolic aspects of the school environment (i.e, its culture), as well as adolescents' and teachers' perceptions (i.e., school climate). Greater understanding of the hidden curriculum will help them to achieve the goal of providing effective schools in the 21st century" (pp. 595).

Linstead (1996) identified culture covers both the working and cultural processes in organizational settings and the emergence of specific cultural forms and practices which may or may not be expressive outputs of the former. What is necessary here is closer attention to the underlying nature of the symbolic process, and the way it connects individual understanding, identity, and subjectivity to wider power relations through language.

Culture refers to norms of behavior and shared values among a group of people (Kotter, 1996). The school has a culture consisting of a rich vocabulary that is unique to the school as an institution. The language of a school identifies the school as a unique institution and is part of the school's "cultural account" (Meyer, Boli & Thomas, 1994). "Institutions are descriptions of reality, explanations of what is and what is not, what can be and what cannot. They are accounts of how the world works, and they make it possible to find order in a world that is disorderly" (Meyer, Boli, & Thomas, 1994, p.328). These accounts are described in a unique and institutionally specific language, a grammar.

A curriculum that changes how math is taught in the classroom and practiced in the home changes the grammar of mathematics and redefines the culture of the school in terms of mathematics. The interviews done for this study indicates that MathLand did just that. Ed and Marj are parents who worried that the culture had been changed to the point of experimentation. Ed said:

> Well, I felt that it [MathLand] was an experimental thing that was done on my son. I thought that he was probably losing out on his math experience. You need something to start out with, and to me this wasn't doing it.

Marj also spoke to the issue

> I just knew hardly anything about it. It was something the teacher said, "Okay, we're doing this. This is great, this is wonderful." And basically, as far as I'm concerned, we were left out in the cold. The idea of it being so experimental (pause) that really scared me because I figured, if it's not working, my child lost out. He was the guinea pig.

A veteran teacher, Paul who addressed MathLand as a parent summed up the parental feelings very well saying, "My big fear was that people, if they didn't know math already when they started, they never would."

Teachers were equally confused by the grammar change. Peter, a teacher, provides evidence of this in the following.

> It was a radical change. It's totally different than anything that was within my experience, and certainly with my training, and all my experience teaching math in particular. MathLand was a total departure from the regular teaching style and teaching methods that we were all accustomed to while teaching math.

Another teacher, Brenda, said:

> ... it was so dramatically different. The teacher style, the student ways of learning, the theories behind it were so dramatically different.... MathLand incorporated all different levels of mathematical thinking. It wasn't traditional. In MathLand, you had problem solving, you had logic, you had verbal and written communication, you had, interactive math that you would do in groups. There were so many other facets of this program that we didn't use as teachers on a day-to-day basis. We didn't know how that was supposed to look in the classroom,

and teachers like to know how it's supposed to look because they become very geared in on making sure that they do it right.

Teachers realized early on that some of the culture change was spilling over into the home, but was not understood, and was not well received. Patrick could sense the frustration and anger parents felt over issues like books and homework. He said:

> Arithmatwists, in my opinion, were worthless. They caused an incredible amount of confusion and anger by parents, and then of course you had the lack of a textbook. Parents needed something to hold onto. Parents needed a textbook that they can help their kids from. So the lack of a textbook was a serious matter for parents.

Administrators were also aware of language problems among teachers and parents. They reacted quickly by attempting to reduce concern by educating parents. Math Nights were offered to help acquaint parents with MathLand. In one school it helped to reduce the objections that parents had to the change in curriculum. But, in some schools, it was not the parents that attended the meetings who represented the opposition, it was the parents who stayed away. Dennis was the principal at a school that focused on educating parents. He said, "We were a little more successful. We had a lot more parental buy in because we worked with parents a lot more. They came to training, and we did a lot of that, so we were a little more successful but still not as successful as we should have been."

Joan saw the other side of the picture. She said:

> I think the ones that came in were fine with it. It's the ones that didn't come in that could not see the different ways that we were doing things and they just

didn't like it. I think there was a whole backlash, actually, of parents who didn't want to have MathLand anymore.

What happened at the start of the MathLand implementation set the stage for what was about to happen to the curriculum. The failure of schools to plan for the change above school level left a void that was filled in with misconceptions and misunderstandings by the community. It was already too late to introduce parents and teachers to the grammar change because their minds were already made up. MathLand was unacceptable and a change was needed. The change that parents wanted was back to the familiar mathematics that they recognized.

The interviews revealed that there was direct and positive action taken on the part of the teachers and administrators to support the implementation of MathLand. Parents initially tried to support the program by helping students with homework. The data revealed that parents began to resent the MathLand curriculum as a result of homework frustration. This situation resulted from a failure to understand the grammar of the MathLand curriculum. The absence of text material, also a grammar change prevented parents from looking up information to help them understand the material and help their students.

MathLand Failure and Curriculum Change

Loveless (1997) predicted the events in the demise of the MathLand curriculum. Reflecting on the New Math of the 1960s he stated:

> We have been down this road before. In the 1960s, the curriculum known as "New Math" was routed from the classrooms by angry parents and teachers.

> Parents didn't recognize the mathematics that children were bringing home from school, and teachers found it almost impossible to instruct students on the strange new topics recommended by reformers. (Loveless, 1997, p.1)

The literature stated these events as benchmarks observed in other failed curriculums. MathLand preformed as predicted. My research unfolded these benchmarks with remarkable clarity. As if on cue these events were revealed throughout the interviews. As stated in Chapter IV, these events were the products of reactions rather than responses to the changes brought on by MathLand.

These events were uncovered during the data analysis and are identified as, recognizing and responding to the unfamiliar, the role of teachers, the modifications begins, parental interventions and, parents speeding up the change process. These events are reactions rather than responses because they were spontaneous by their very nature, not considered, and planned events. The only exception is the planned meeting with the NCA committee. It was truly a conspiracy with the explicit intent to expedite the change away from MathLand by taking advantage of an outside agency to influence that change.

Recognizing and Responding to the Unfamiliar

Parents are at the root of the "innumeracy pandemic." Adults are more open about their ineptitude with math than they are about their inability to read. For many parents, their student's mathematical ineptitude was acceptable, as long as they were inept in traditional math (Battista, 1999).

Battista's findings set the course that would be followed when MathLand ended. It predicted and agreed with what parents said about the MathLand curriculum when they

compared it to their own mathematics education. For example, one parent, Paul said, "I was taught math in a relatively traditional way. MathLand, from my point of view, seemed like a radically new approach. Numbers were missing. It just seemed so airy—fairy and concept based that I couldn't find any traditional math.

Another parent, Sheri, said, "The traditional style wasn't taught. It was more of a problem solving only technique. It wasn't drill and practice." Marj said, "It wasn't taught the traditional way like with a drill. It's the basics that you had to drill over and over to make sure that kids had them down pat. It seemed to lack all of that." Battista (1999) also found that parents were not as concerned about students failing math as long as the math was familiar. The angst caused by a failure of parents to recognize the mathematics being taught and the frustration that parents felt when they were unable to help students with homework, exploded into resentment of the curriculum followed by a strong desire to have it replaced with the familiar. Ed said:

> I don't really see that I could support it in any way because I just knew hardly anything about it. It was something the teacher said, "O.k., we're doing this. This is great, this is wonderful." And basically, as far as I'm concerned, we were left out in the cold. I'm glad they've done away with it! Sue, another parent said: I'm glad that it's out. I feel that my child is now being taught from a math curriculum with a structured book, workbook, worksheets, work pages, whatever. When she (her daughter) brings home her book, if I don't understand what she's got on the worksheet, then I can actually read the book as well. I could help her.

Sue clearly identified that parents viewed MathLand as a common enemy and yielded evidence of a parent coalition to put a stop to the practice of the MathLand curriculum in the Department of Defense schools.

The Role of Teachers

Only 40% of the teachers interviewed gave evidence that they were true MathLand practitioners at the point in time when MathLand was terminated in the Department of Defense schools. The time that it took for the other 60% of the teachers to begin to use old curriculum materials during the MathLand implementation varied from teacher to teacher. The majority of participants admitted to supplementing the MathLand curriculum with materials from the old curriculum. Peter said:

> After about a month or two of the MathLand, many of us quietly closed our doors and went back to what we knew best and what the parents expected. So basically, we flushed it pretty quickly. But I would only say that now. I would never have admitted that earlier.

And, when asked why she used the materials from the old curriculum, Joan said:

> Some of the teachers did not understand it. I never received a teacher's manual to help me get answers. For some problems you could have several kinds of answers. I had a difficult time giving those practice books to the children because they were difficult and I think when you work with little children you need something easy first and then you build on that to more difficult things. They were very difficult.

So how did the teachers, who hung on to MathLand, hang on? What led them to champion MathLand in the face of adversity? Brenda said:

> The MathLand program is actually less boring. It was less traditional and that was really kind of refreshing for kids because, I remember, they had to learn to think more for themselves rather than just strictly through computation. They had to be able to show their mathematical thinking either verbally or written communication which then meant that you could sometimes see exactly where they were going wrong, which is why in computation you always say, 'Show your work.' But you could see where they were making mistakes and then go right to the core of the problem of why they couldn't get the answer.

Sarah believed that she had an obligation to teach the MathLand curriculum the way it was designed. She said:

> It was done with a script and "you read this and they do this" and, and I tried to follow it as closely as possible. I know a lot of teachers were so uncomfortable with it that they continued to do a lot of their own types of things. But I tried to follow through with it and do it the way that I understood it was supposed to be done.

The Modifications Begin

The data showed that modification of the curriculum had occurred fairly soon after it's introduction. Three main reasons for the modifications were uncovered. The first was teachers moving back into a comfort zone of teaching. Teachers were reaching back into the old curriculum and teaching from old, familiar, and comfortable lessons in

some cases almost abandoning the new. The second was that teachers felt sure that they understood the kind of mathematics that parents wanted taught in their classrooms. The familiar drill and practice sheet came back to the kitchen table at night and parents were able to help students with familiar homework assignments. The third reason was that teachers were working well within their experience range in mathematics. Teaching an old and familiar curriculum was a preferred task compared to teaching a MathLand curriculum that challenged even experienced mathematics teachers. Sarah, an outstanding parent-teacher, summarized the difficulty mathematics teachers faced during the MathLand implementation. She said:

> I don't know that I could have made that program more successful. There wasn't a textbook, which concerned a lot of parents. Also, the parents weren't aware of what kind of activities were going on in the classroom because the child didn't bring home anything tangible such as a worksheet or daily work. Maybe the most outstanding math teacher could have made the program successful and could have filtered some things like that, but the program as it stood by itself didn't allow the parents much opportunity to influence their child and to help their child at home.

Not all teachers were able to stand the test of adversity. Many teachers began to modify what was given them to teach early on. These coping strategies provided a breath of life for an already dying curriculum. This was by no means a change in the product, it was a change in the process of how the product was being delivered.

There were a range of responses by teachers to the MathLand curriculum. I did not find any teachers who said they continued to teach the old curriculum in spite of the new implementation. All teachers gave the MathLand curriculum a try. Sarah indicated

that she knew of teachers who began to make a blend of the old and the new curriculums early on. This supports the statement that teachers will modify directives to meet local needs (Loveless, 2000).

The act of modifying the curriculum is an act that bends the rules. Clearly the teacher or teachers involved were not teaching the curriculum the way it was designed. This act did not constitute an abandonment of the curriculum. By hybridizing the curriculum, teachers moved the language and the style of teaching of the new curriculum back into their own personal comfort zone. They enabled themselves to continue teaching mathematics to the students. One administrator, Linda, explains

Each teacher needs "meaning making." It doesn't matter that a lead teacher had had ten days of training. A lead teacher getting ten days of training and then condensing that into two days for a person whom is not as excited about it. That does not work.

The research uncovered evidence that the license to deviate from the MathLand curriculum was endorsed by parents and sanctioned by administrators. Sheri, a parent, said, "There were still some of the teachers with the old hats that kept some of the other things aside, especially one of my daughter's teachers. She was able to get the basic thing. So she was being taught the real thing, not just MathLand." One administrator, Dennis, allied with his teaching staff he had the sensitivity to perceive that his staff was having difficulty with the implementation. He said:

> I knew teachers were frustrated with it. I tried to work with teachers and tried to relieve as many of their anxieties as I could and try to work together. I guess I need to go back to what my style of administrating is. If you notice my whole building is gray on the interior. That's kind of how I operate: in the gray area.

I'll take what the boss says to do and if I don't quite agree with it I will do just enough to make sure that it doesn't come down on my neck. That's what I did with MathLand.

Supplementing the MathLand curriculum with additional materials constituted a breach in the integrity of the curriculum. A breach in the integrity of a new curriculum, whether by a member of the teaching staff or by an administrator, inadvertently sends out an subtle but clear message. In this case, the message was that there was a definite lack of confidence in the MathLand program. The dramatic change in grammar might have been too much for teachers; it certainly shook their confidence in their own abilities as a math teacher. Perhaps some were unable to make the change at all.

Parental Interventions

Parental support for any curriculum is withdrawn when confidence in the teachers, the curriculum, or both fails. In the case of MathLand confidence was shaken in both the teachers and the curriculum. Math Nights provided a forum for the teaching staff to demonstrate their competence, but did little to improve the acceptance of the MathLand curriculum. This resentment turned to anger as ugly articles about the MathLand curriculum were printed in the military newspaper *The Stars and Strips*. Dennis, an administrator, notes the objections to the curriculum.

If you read any of the letters to the editor, the scathing letters about, "Well what is this? Kids are playing with stuff without learning anything." You know you had a wall built up already and you were never going to jump it.

Teachers freely admitted to making change in the MathLand curriculum. Principals practiced a laissez-faire attitude about what went on behind closed doors. They did not pursue teachers who did not follow the curriculum. Parents did not complain to administrators about teachers who were not following the curriculum. The indifference allowed the curriculum to die from neglect and a nostalgic desire by many parents and teachers to return to the familiar grammar of the old curriculum. This echoed what Loveless (1999) said, "Those schools whose educators disagreed with state policy either ignored the reform or undertook it grudgingly and, in a limited way, waited for it to wither and die" (p. 49).

Parents Speed Up the Change Process

Parents were far from ambivalent about the issues surrounding MathLand. In fact, the interviews revealed evidence of a growing impatience with the failure of DoDDS to quickly reverse or replace the MathLand curriculum. As mentioned above, the *Stars and Stripes* provided a forum for teachers and parents to vent their discontent with MathLand in the Letters to the Editor section. Coalitions formed between parents and teachers, and battle lines were drawn to do away with the program in the schools.

One parent researched the authors of the MathLand curriculum and declared that the authors were not mathematicians. Peter, a teacher, said:

> This mother, her husband was a doctor over at Groveland and they lived here on base and she was very vocal. She researched MathLand and looked through it and wrote a report on her findings. She gave me a copy of it, which I can't find. The

only thing I remember from that was that she pointed out that there were no mathematicians as authors in the MathLand series.

A parent, Sue, recounted an incident that occurred during an NCA visit when a parent group brought pressure to bear on a school that was practicing the MathLand curriculum. Sue said:

> We had a committee of parents, who were not on the SILT committee, get a group of parents to come in and specifically speak about MathLand and other issues, so I know the NCA had to know. We told them about what we thought of MathLand.

One parent, Dick, worked with a classroom teacher and acted in consort with other parents by purchasing a different mathematics textbook as suggested by the teacher. He said:

> Last year in fourth grade, we bought an additional book besides what DoDDS was using. The Saxon Math textbook, and he [our son] worked the whole thing. Saxon math seemed to have a little bit different approach not that it didn't teach the process, but it emphasized getting the right answer over emphasizing the process.

This is clearly another example of a coalition formed by parents and a teacher with the idea of modifying the MathLand curriculum. Once again the interviews revealed that various groups worked in consort to remove the unwanted curriculum by applying pressure at a variety of school levels. The assault continued until the desired goal of removing the curriculum was achieved.

Summary

The absence of a grammar lesson for parents, teachers, and administrators established early on which direction the MathLand curriculum would follow. Deviation from the original design of the curriculum practiced by teachers and allowed by administrators was disastrous. Change is difficult enough to accept, but change to the change was trying to do the impossible. The curriculum was not strong enough or well presented enough to withstand a retrofit. The education in grammar would continue to stifle any attempt to implement the desired change. The support materials that found their way into the classroom soon became the new curriculum to replace the MathLand series. During the interview process, only one teacher, Brenda, admitted to still using the best of MathLand during her math lessons.

CHAPTER VI

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND DISCUSSION AND COMMENTARY

Two years ago DoDDS [Department of Defense Dependents Schools] implemented the new-new math programs, MathLand in elementary school, and Interactive Mathematics in Jr. high. The first year of implementation was a complete disaster for most students, as evidenced by the dismal performance on the CTBS [California Test of Basic Skills] tests. Computation scores dropped significantly, (e.g., -23%, -19%, -15%) and gains in Concepts and Applications appear negligible (e.g., +2%, +3%) particularly when there were areas of significant decline (e.g., -10%, -11%, -8%).

.... According to the 1994 Public Agenda poll, 96% of Americans want tougher and more challenging courses in the basics. And what did we get? MathLand. (McArthur, 1997)

Summary of the Study

The literature revealed that the culture of mathematics in schools has a strong thread of nostalgia woven into it. This research has revealed that if the school removes

the nostalgic thread, then the very fabric of the culture is undone. The language or grammar of mathematics is the fiber that makes one of the threads. Grammar played a significant part in the failure of MathLand, but other factors contributed to the failure of the curriculum. Top-Down decision-making also played a role in the failure.

Top-Down Decision-Making

Dennis said in his interview he believed that it was a top-down decision to implement MathLand. Not one of the people interviewed believed that they participated in the decision to implement it. Many people were surprised by the sudden shift toward a new curriculum. Normally a curricular standards review and the adoption of a new book to meet those standards precede the process of a curriculum change. This was not the case with MathLand. In a recent article, Eisner (2003) summarizes the faulty logic that may will have played a part in bringing MathLand to an early end.

> ...when schools are not wholly oblivious to policy changes, they engage in forms of adaptation that give the illusion of change but do not constitute its reality. Indeed, unless teachers and school administrators buy into reform efforts, unless they are part of the group that participates in designing the reforms, little is likely to happen. After all, the only place that educational reform makes an educational difference is where the rubber meets the road: in classrooms. And in classrooms teachers are kings and queens. Thus the idea that policy can be prescribed from on high, issued ex cathedra, is a comforting one for policy makers, but it is a problematic one as far as school improvement is concerned. (p. 654)

MathLand began with the support and enthusiasm given to any new curriculum. At the same time, it was also hampered by the skepticism of any novelty introduced into any large organization. The interventions made by the educators to maintain the façade of math being taught in each classroom did little to advance the cause of the MathLand implementation. It did even less to make the culture of the DoDDS mathematics program acceptable to parents and educational practitioners. Finally, it collapsed from the weight of malevolence and neglect.

Factors that Support the Literature

The change in methods and delivery of the curriculum are supported by the notion of culture and grammar change. The call for math reform did not call for the teachers to discard all of their old tools. Teachers interviewed said that they maintained a standby set of resources that allowed them to teach more traditional math when MathLand needed a boost. Both teachers and parents stated that many parts of the MathLand curriculum were difficult to understand and difficult to work with or teach. During her interview, Amy said that parents were not okay with students failing mathematics that they could not understand. She also said that teachers spent planning time working out answers to MathLand problems and not a lot of time planning to teach. Administrators, Amy and Dennis said that they and parents lost confidence in the teachers' ability to teach the MathLand curriculum.

Factors That Did Not Support the Literature

In spite of the demise of MathLand, some teachers continued to use elements of the curriculum. Neither teachers nor administrators said that MathLand was poor as a curriculum. Paradoxically both teachers and administrators pondered ways that they could have made the curriculum more successful. One parent, Maureen, saw a benefit to the "out of the box" thinking that the MathLand curriculum provided. The introduction of the "supplemental materials" (a textbook) did not require an additional publicity campaign complete with goals and lengthy explanations. The administrative concern about the image of the math program diminished following the introduction of the supplemental materials. Two of the teachers using the curriculum remained true to the integrity of the program until change was authorized in spite of the relaxation of rules about using ancillary materials. There are exceptions to every rule. This contradicts Sarason's (1996) notion that changes in programs handed down from above the classroom level are changed and modified to meet local needs.

Conclusions

The data analysis led to the following conclusions. The introduction of MathLand followed the theories for change and failure to make change very closely. Loveless and Sarason's conclusions about the failure of New Math of the 1960s were mirrored by the MathLand implementation. Both curricula deviated dramatically from the traditional math that preceded them. MathLand, like New Math, introduced new grammar to the culture of schools. Both parents and teachers found it difficult to follow in terms of

homework and class work. Training in both cases was shallow, or non-existent, and was not grammar focused. In both cases the failure was predictable.

I found that the introduction of a radically different curriculum like MathLand follow the theories put forth by Sarason (1996), Loveless (1997) and Battista (1999). But my review of the literature did not find grammar addressed as a cause for the failure of curricula. I believe that the damage done to the implementation of radical curricula is a great deal more sinister and difficult to detect. Sometimes a grammar omission is masquerading as poor training, lack of support, or it can manifest itself as homework problems without a book to help with the grammar problem. Teachers had no trouble saying that MathLand hit them into left field or that they spent their entire preparation time problem solving middle school math homework. No teacher would spend day-after-day struggling with math problems knowing that if they understood the grammar then the problems would be easier to solve. I believe that grammar represents a real knowledge gap in the successful implementation of curricula.

In practice, school systems should research grammar prior to curricula selection. That research should take into consideration two facets of grammar proposed by (Tyack & Cuban, 1995), "descriptive (the way things are) and prescriptive (the way things ought to be)" School systems should task with listing a grammar "prescription" which will become descriptive when implementation is successful. Parents, teachers and administrators should be schooled in that grammar to avoid confusion and promote the change desired for the school.

John Dewey (1929) assured us that public schools would continue to make change. He called for teacher preparation to stand ready for change. "Command of

scientific methods and systemized subject matter liberates individuals; it enables them to see new problems, devise new procedures, and in general makes for diversification rather than for set uniformity" (Dewey, 1929, p.12). Sarason (1996) states that change will be driven by technology and changes in the needs of society. As technology changes societal needs change keeping pace. More radically different curricula will be introduced as a result of developing technologies. School systems must stand ready to accept these changes or loose their technological edge.

There are critical elements that are essential to the introduction of curricula. During the implementation of traditional curricula, many elements are culturally contained in the grammar of the school. Nontraditional curricula must overcome the established grammar of the school by introducing an establishing a grammar of its own. Elements that are left out begin a cascade of events that bring about the demise of the curriculum in question. This study identified the social and political interactions among the administrators, the teachers, and the parents involved in the implementation process. In December 1998, DoDDS director, Dr. Lillian Gonzales responding to parental concerns regarding MathLand, specifically addressed three issues: more focus on the basics, MathLand not teaching adequate skills, and teacher understanding. Gonzalez directed that all teachers and schools would receive copies of the DoDDS Mathematics Curriculum along with supporting materials. These materials were to be supplemental instructional materials to include a textbook with more traditional math work. "Supplemental Materials Task Groups" were formed to select materials for improving mathematics instruction. This group would include parents, educators, and curriculum specialists. The supplemental books were introduced in early February 1999,

accompanied by a 45-minute parent meeting to announce the change. After all of the parent meetings and huge amount of concern, MathLand ended.

Using qualitative research design, this study discovered the role that grammar played in the change process. As well as the steps already in place for implementing curriculum change, adding grammar to the steps of the implementation, especially for radical programs might benefit future implementation of radical programs.

Interviews indicated that the failure to educate staff and parents in the grammar of MathLand introduced a ripple effect. These events began with training issues for teachers. Parents experienced problems with homework and took issue with the absence of traditional materials such as textbooks, workbooks, basic computation skills, and homework. Teachers were not prepared to teach concepts and experienced difficulty with presentation. Parents lost confidence in the teaching staff and pressured administrators and above school administrators for change. Administrative pressure to implement MathLand quickly led to a culmination marked by regression to a previously practiced curriculum taught with manipulatives.

The change in the language of mathematics resulted in an unacceptable culture change in the DoDDS mathematics curriculum. This study uncovered the powerful role that grammar plays when introducing programs like MathLand.

Implications

The power of grammar has not been established. There are a number of books and articles written about the implementation process, but none address the gap found between grammar and the successful implementation of radically new curricula. Further

research would add to our understanding of grammar by investigating other curriculum failures to see if there is evidence that links those failures to grammar. Further research is also needed on how best to introduce new grammar for radical curriculums that replace other, more traditional, curriculums.

MathLand serves as an excellent example of innovation that was rejected because of a failure to understand the grammar of the curriculum and/or design strategies to deal with it effectively across impacted populations. It is important to be able to revise curricula and to advance the methodology of teaching by successfully implementing innovative programs that assist in the classroom and in the knowledge base for the learner. The interviews revealed parents, teachers and administrators who recognize the need for educational change, but all of these groups wanted to see improvement in the learning process as a result of these changes.

School improvement is at the top of many school committee agendas across the United States. Continued research into curriculum is needed to assist in the change process. Further research is needed into the impact of grammar.

Since the data indicated that the implementation of MathLand was a top-down decision, a study could be done on the *Effects of Forced Compliance: Theory* (Festinger, 1957, pp. 84). Both administrators and teachers waged a strong public relations campaign to convince the local community that MathLand was an excellent program for students even though some teachers and administrators clearly believed that it might be, and parents were not convinced that it was:

> Let us imagine that influence or pressure is exerted on a person to change his opinion or beliefs or actions. Sometimes such influence will not be successful in

> that no change is brought about. Sometimes it will be successful in the sense that the person will actually change his opinions or beliefs. Other times such influence may be successful in that the person changes his overt behavior or overt verbal expression of his opinions while *privately* he still holds to his original beliefs (pp. 84-85).

Implications for Practice

Evidence suggests that there is little salvation for radically new and different curricula without a careful plan for implementation that must include intensive training for all teachers and parents before the implementation process begins. The teacher corps would receive periodic enrichment training in the curriculum with subject expertise as the area of focus. Parental input into the change process should be given priority. All reasonable changes in the curriculum in order to meet parental expectations should be accommodated. All grammar changes should be identified and agreed upon before the change process begins.

Empowering a Committee. All of the reasons for change must be clearly spelled out in a meeting of all stakeholders in the change process. Volunteers should be solicited at the meeting to serve on a team of curriculum evaluators. Goals and benchmarks should be established to provide a type of quality assurance that the new curriculum is meeting expectations for implementation. Periodical evaluations must be given in the form of surveys to parents during the implementation process and revisions made to the implementation plan as needed by a team of evaluators called a Curriculum Evaluation Team (CET). The CET should include and primarily be made up of

stakeholders in the implementation process such as parents, teachers, and administrators involved in the change process. Above school administrators should serve in an advisory capacity and as facilitators in the change process. They should provide advice to the CET based on studies of radical curriculum changes that were successful in other schools.

Measuring Change. Continuation of the change process should be made after a careful review of the benchmark goals, data collected in surveys, and CET input into the change process. Other considerations may be given to beginning change at a particular grade level and allowing the change to take hold over a longer period of time as opposed to a radical change over several grade levels at the same time. As benchmarks are achieved and grammar becomes established, the curriculum established should reflect ownership by all stakeholders and the CET. The CET should also take responsibility for establishing workshops for parents, administrators, teachers, and students who transition into the school system during the school year. The CET should establish a schedule in order to minimize the wait time for parents and students before service can be obtained.

The Need for Text. Finally, there is an old teacher saying that textbooks don't make the curriculum, teachers do. While a degree of truth is found in this logic somewhere, the real issue is that no matter how obtuse or obscure a curriculum is, there must be some type of literature, a grammar book, to anchor the names of the tools. The evidence was overwhelming that one of the reasons why parents resented MathLand was the result of the homework troubles. These troubles began because parents could not bridge the gap in the grammar being taught in the classroom. Parents found it impossible to aid or assist in the MathLand homework because they could not properly identify any

of the tools required for completing the assigned tasks. A text that can clearly identify and present the grammar change in the new curriculum is essential.

Discussion and Commentary

> *Circumstances are like clouds continually gathering and busting—While we are laughing the seed of some trouble is put into the wide arable land of events—while we are laughing it sprouts, it grows, and suddenly bears a poison fruit, which we must pluck. (Keats, letter, 1819)*

There were road signs along the way that clearly pointed to the demise of MathLand. The year before MathLand was adopted as the premier new mathematics curriculum for the DoDDS school system; it was shunned in California. It had gone from being a statewide adoption of a radically new and promising mathematics curriculum to a hot political topic in local schools. In California, MathLand was condemned as bad practice, and as sadly lacking in mathematics fundamentals. Within one year of the MathLand adoption in California, it was in the process of being removed and replaced in many school districts. The Department of Defense School system did not heed that message and was doomed to suffer the same fate.

DoDDS services a highly diversified and transient work force. In the two years before DoDDS introduced MathLand, several states had experimented with MathLand or a new math of similar genera, without success. Parents entering the DoDDS system from military bases in the United States brought their prejudices about school mathematics programs with them along with the household furniture. DoDDS was singing the praises

of the MathLand program, but not to an uninformed public. Many parents had already seen the verdict turned in at their last stateside duty station.

This supposition that DoDDS was uninformed concerning stateside failures of MathLand implementations is based on a preponderance of evidence that exists in connection with the MathLand failure in the DoDDS system as well. Much of what happened in terms of mistakes and omissions in stateside school systems was repeated again by the DoDDS school system. It was as if MathLand had slipped into DoDDS without a prior record of failures.

DoDDS operated as if in a vacuum. The implementation went forward as though the results of the stateside trials and tribulations were nonexistent. My research leads me to believe that it was not an act of arrogance. It was the act of a huge organization caught up in the momentum of completing a difficult task. The change set in motion could not be stopped, and worse still, no change to the change was acceptable. I found it interesting that DoDDS made the same series of mistakes that many states like California had made only a year or two earlier.

My research into the literature surrounding the MathLand uncovered an astounding number of similarities in the failure in both the stateside and DoDDS school systems. Parents were left out of the pre-implementation phase of the MathLand introduction. Teachers were not trained well enough to sustain the changes that MathLand demanded. Concerns were raised about the quality of a math program that dismissed the need for teaching mathematics fundamentals like calculations and other grammar related concepts. The absence of math books and regular homework in basic math was also a concern. Not arriving at a precise answer for math problems and parents

having trouble understanding homework and assisting students with homework was yet another.

There were some major differences between the failures on both sides of the Atlantic. DoDDS attempted damage control on the MathLand image. The teachers and administrators presented MathLand concepts to parents during Math Night programs. Teachers supplemented the program with more traditional mathematics. This helped to reduce the resistance to change by parents by providing a comfortable, more familiar curriculum. DoDDS continued to defend the change as research driven and beneficial to the students. Sadly it was too little too late. The seeds of poison planted in the United States were already bearing fruit within the DoDDS system.

The purpose of this research was to identify the primary cause of the demise of the MathLand curriculum in the Department of Defense School System. The main culprit suggested was grammar. As the research progressed, I came to understand that there was no single entity that would destroy a curriculum. The literature pointed to several causes for curriculum failure and my research did uncover them. What I expected to find was a single cause that one could point to and say this is it; this causes a curriculum to fail. But my research did not justify that statement. It did however; find that grammar does play an important role in the success or failure of radical curriculums like MathLand.

Perhaps in the ashes of the MathLand failure there are some clues to future studies. It would be interesting to see if a program like MathLand could be incorporated into an existing math program for the benefit of kinesthetic learners or as an alternative solution to a real world problem. It was interesting to me that not a single teacher said it

was a bad program. Many, like Brenda, suggested other ways of using MathLand. She said that she continues to use the best of MathLand in conjunction with the best of her present curriculum to help all of her learners.

Linda best summarizes the impact that MathLand had on the Department of Defense Schools:

> We went through a time where there was no curriculum head in DoDEA in Washington headquarters. Without the individual leadership of the liaison or the curriculum coordinator to know that "This didn't work...and ... This did work when we did it before." When you don't have the leadership at the top, someone that understands—who can actually make decisions and can understand the needs—then something's not going to follow through, and that's part of why I think it didn't happen.

The new materials were far more traditional than the MathLand materials, so there was a comfort level for many teachers. Whether they believed in that approach or not, they knew how to use the older style materials even if they believed in the MathLand approach. Teachers who had never been fully comfortable with the MathLand approach now had materials that were more in keeping with what they'd been trained to use and what they had used previously. So there was not a need for training, there was not a need for the communication to parents, there was not a need for a radical public relations campaign or training, campaign because it looked like what people had prior to MathLand. We knew hands-on was important, but there was more of the hands-on and/or higher level thinking in MathLand. I think people found a comfort zone with the new materials, which meant they didn't feel the need for all the training or of all the

communication or all the reassurance. This was the right way to go this was needed during MathLand for both parents, and staff, and probably administrators. Because if staff isn't complaining and parents aren't complaining then administrators are obviously happy and they have plenty to do, so if there aren't any complaints coming in, then they're going to be happy to let it be that way.

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APPENDIXES

APPENDIX A

INTERVIEW QUESTIONS FOR ADMINISTRATORS

What can you tell me about the implementation of the MathLand program?

1. Did you feel pressured while you were in the implementation process? If so by whom?
2. What pressures did you apply to try and assure the success of the MathLand program?
3. Looking back from where we are now, what could have been done differently with the program that might have made it successful?
4. What did you see as the greatest barrier to the success of the program?

APPENDIX B

INTERVIEW QUESTIONS FOR TEACHERS

1. What can you tell me about the implementation of the MathLand program?
2. Did you feel pressured while you were in the implementation process? If so by whom?
3. What strategies did you apply to try and assure the success of the MathLand program?
4. How well did pre-implementation training prepare you to promote and teach MathLand?
5. Looking back from where we are now, what could have been done differently with the program that might have made it successful?

APPENDIX C

INTERVIEW QUESTIONS FOR PARENTS

1. What was different about the MathLand program when you compared it to the way that you were taught math?
2. What steps did you take to support the MathLand effort?
3. What concerned you about the MathLand program?
4. If you had concerns about the program what steps did you take to try and make changes in the program?
5. Whom did you speak with about your concerns and what were the results?

APPENDIX D

INFORMED CONSENT

I,_____, hereby authorize Harold D. Mills to interview me in conjunction with this research a case study of the MathLand curriculum. This research is being conducted through Oklahoma State University. The Principal Investigators are Harold Mills, a doctoral student, and Adrienne E. Hyle, a professor, in the School of Educational Studies in the College of Education.

If you decide to participate, the interview will take approximately one hour. I will arrange for a time and place that is convenient for you outside of your workday. The interview will be audio taped to ensure that all responses are recorded. Once I have transcribed the tape, it will be returned to you along with a copy of the transcript. The number at which to call you to make arrangements to return the tape and provide you with a transcript review is: _____. Please call me to pick up your revised transcript.

Your name will not appear on the transcript or tape. You will be assigned a pseudonym to protect your confidentiality. Your approved copy will be kept in a locked file cabinet in my home until the research is completed at which time it will be shredded.

Your participation in this research is strictly on a voluntarily basis. At any time during or after the interview if you feel uncomfortable with an answer or with the interview process, the interview will terminate and the information obtained will be discarded.

This study does not provide compensation to the subjects.

There is also no direct benefit to the individual participants. This research will be added to the wider body of educational practices that will assist in the continued improvement of instruction in the Department of Defense Schools as well as the community of education in general.

There is no risk to the participants from this interview and no obligation on their part to participate.

For questions about the research, please contact:

Adrienne E. Hyle, Professor
Oklahoma State University
106 Willard Hall
Stillwater, OK 74078 Phone: 405-744-9893

Harold D. Mills
Lantyne Mill Drift
Hockwold, Norfolk
IP 26 4NG

Sharon Bacher, IRB Executive Secretary,
Oklahoma State University
203 Whitehurst
Stillwater, OK 74078 Phone: 405-744-5700.

I understand that participation is voluntary and that I will not be penalized if I choose not to participate. I also understand that I am free to withdraw my consent and end my participation in this project at any time without penalty after I notify the project director, Adrienne E. Hyle, at the address or phone noted above.

I have read the above statements and have been fully advised of the procedures followed in this project. I volunteer to participate. I sign it freely and voluntarily. A copy has been given to me.

I have read and fully understand the consent form.

Date:_____ Time: (a.m./p.m.)

_____

Name (typed) Signature

I certify that I have personally explained all elements of this form to the subject or his/her representative before requesting the subject or his/her representative to sign it.

Signed:_____

Harold D. Mills

APPENDIX E

LETTERS

Dear

I am writing to invite you to take part in a research project that I am working on as part of my dissertation leading to a doctorate in education leadership. This is a case study of the MathLand curriculum.

If you agree to participate, I will conduct an audio taped interview at your convenience lasting no longer than one hour. The data will be transcribed and analyzed for the purposes of the study.

There can be further opportunities to participate if you wish.

If you agree to participate, I will provide you with a consent form and further information. We can then establish a time and place to conduct the interview. I will include the consent form, which you can sign and return in the self-addressed envelope included. If you have further questions before agreeing to participate, please feel free to contact me at home, phone: 01842-827314 or e-mail at: mllsharold@aol.com

Your time is appreciated and I hope that you will find this study of interest.

Sincerely,

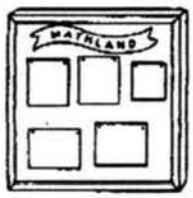
Harold Mills

Dear Family, Date _____

This year your child will be learning mathematics the **MathLand** way—by doing a variety of rich mathematical projects. You can expect a difference this year, both in the way your child is being taught mathematics and in your child's attitude and sense of excitement about mathematics.

The MathLand program is organized around exciting, weekly projects that will involve your child in *thinking*, *writing*, *talking*, and *doing* mathematics.

You won't be seeing worksheets this year. Instead, your child will generate recordings and reports on blank paper. Your child will still learn basic computation skills in math class. These skills are important tools your child needs to solve many of the higher-order thinking problems we will be doing this year. At reporting time, when we look through your child's portfolio of work, you will gain many insights about your child's mathematical thinking—insights that would not have been possible from looking at traditional fill-in-the-blank worksheets.



Your child will work with a partner on most projects. By working in pairs, children learn to interact successfully with others, and better thinking results when children (or adults) have a chance to exchange ideas. There will be times when the class explores an idea together, creating a large wall chart to show our work. Come by our class often and see our MathLand bulletin board!

Because your child's learning need not be confined to school, your child will receive a Student Letter each week telling what we have been doing in MathLand and offering a homework suggestion for your child to do, sometimes with a family member. Sometimes your child will be asked to send the results of an activity back to school. Save and repeat activities that you think are especially fun or beneficial for your child.

There are some ways in which you can help. If you have access to paper that we can recycle by using the back side, please send it in. We also can use colored paper, card stock, and cardboard. In addition we may ask you to save and send to school such things as empty boxes, cartons, cans, or plastic jars for some of our projects.

It's going to be a great year. We're looking forward to sharing it with you.

Sincerely,

P.S. Two other things always needed are cellophane tape and film for photographing the oversize work that won't fit in the children's portfolios. We would consider it a special gift if you would contribute either of these sometime during the year.

Our class camera uses film size _____.

APPENDIX F

SUPERINTENDENT/PRINCIPAL APPROVALS

Enclosure 2

Superintendent/Principal(s) Approval

I have reviewed the Research Study Request for: Hanja H.S.
entitled Curriculum Implementation: A Case Study

I agree/disagree (circle one) that my school will participate in this research study. I also understand that given my approval, this research will be conducted in accordance with DoDEA policy.

Date: 20 December 2002 School Name: Lakenheath ES

Principal's Name: E. Drozdowski

Principal's Signature: [signature]

Please forward this request to your Superintendent after completion of this form.

The following should be completed by the Superintendent:

I agree/disagree (circle one) that my school will participate in this research study. I also understand that given my approval, this research will be conducted in accordance with DoDEA policy.

Date: 01/19/03

Superintendent's Name: Scarlett R. Rehrig

Scarlett R. Rehrig
Superintendent, U.K.
Unit 5185 Box 470
Apo AE 09461-5470

Superintendent's Signature: Scarlett R. Rehrig

The following should be completed by the Principal and/or Superintendent.

If you disagreed above, please state your reasons below.

Superintendents: Return to the DoDEA: Chief, Research and Evaluation Branch
Fax: 703 696-8924

Form 2071.24 (pending OMB Forms approval)

DoDEA-R 2071.2
Enclosure 2

Superintendent/Principal(s) Approval

I have reviewed the *Research Study Request* for Harold D. Mills
entitled Curriculum Implementation: A Case Study

I agree/disagree (circle one) that my school will participate in this research study. I also understand that given my approval, this research will be conducted in accordance with DoDEA policy.

Date: 14 January 2002 School Name: Bolsgell Elementary School

Principal's Name: Henry B. Benoit, III

Principal's Signature: Henry B Benoit III

Please forward this request to your Superintendent after completion of this form.

The following should be completed by the Superintendent:

I agree/disagree (circle one) that my school will participate in this research study. I also understand that given my approval, this research will be conducted in accordance with DoDEA policy.

Date: 01/19/02

Superintendent's Name: Scarlett R. Rehrig

Scarlett R. Rehrig
Superintendent, U.K.
Unit 5185 Box 470
APO AE 09481-5470

Superintendent's Signature: Scarlett R. Rehrig

The following should be completed by the Principal and/or Superintendent.

If you disagreed above, please state your reasons below.

Superintendents: Return to the DoDEA: Chief, Research and Evaluation Branch
Fax: 703 696-8924

Form 2071.24 (pending OMB Forms approval)

Enclosure 2

Superintendent/Principal(s) Approval

I have reviewed the *Research Study Request* for Harold Mills
entitled Curriculum Implementation: A case study.

I agree/disagree (circle one) that my school will participate in this research study. I also understand that given my approval, this research will be conducted in accordance with DoDEA policy.

Date: 21 December 2001 School Name: Lakenheath Middle School

Principal's Name: J. K. Price

Principal's Signature: J. K. Price

Please forward this request to your Superintendent after completion of this form.

The following should be completed by the Superintendent:

I agree/disagree (circle one) that my school will participate in this research study. I also understand that given my approval, this research will be conducted in accordance with DoDEA policy.

Date: 1/19/02

Superintendent's Name: Scarlett R. Rehrig

Superintendent's Signature: Scarlett R. Rehrig

Scarlett R. Rehrig
Superintendent, U.K.
Unit 5185 Box 470
Apo AE 09461-5470

The following should be completed by the Principal and/or Superintendent.

If you disagreed above, please state your reasons below.

Superintendents: Return to the DoDEA: Chief, Research and Evaluation Branch
Fax: 703 696-8924

Form 2071.24 (pending OMB Forms approval)

APPENDIX G

RESEARCH STUDY REQUEST

Research Study Request, Endorsement and Agreement

Part 3

Guidelines:

1. Research involving campus level personnel, especially that which involves principals, teachers and students, may only be conducted between October 1 and May 1.

2. Research involving pupils and personnel of the DoDEA must protect the dignity, well-being, and confidentiality of the individual(s), including the rights guaranteed legally and constitutionally and by DoDEA policies. All information obtained is held in the strictest of confidence, under the Privacy Act (5 USC 552a).

3. The research shall not unduly interfere with the classroom instructional process or the regular operations of the school or district.

4. Personal, social, and psychological research of any nature must NOT be in conflict with the rights of individuals or groups.

5. Approved research shall be conducted in accordance with the policy and regulations of DoDEA. The researcher shall cooperate with the staff member(s) designated by the district or school to coordinate the research. It is the researcher's responsibility to become familiar with DoDEA operating policies.

6. Approval of a request to conduct research is not an endorsement and does not compel any personnel of the DoDEA to participate in research studies.

7. An approved research study may be terminated at any time by the Principal; Superintendent; Chief, Research and Evaluation Branch; Associate Director for Research and Evaluation; or the Director, DoDEA.

I acknowledge receipt of the Guidelines for Research in DoDEA and agree to abide by the guidelines as stated.

I acknowledge that Privacy Act information will not be issued to me unless I have 1) been informed that I am receiving Privacy Act information, 2) collected Privacy Act waivers from each participant, and 3) executed an agreement acknowledging the strictures for the Privacy Act and my duties to adhere to that Act.

[signature] 5 Dec 2001

Signature of Researcher Date

APPENDIX H

RESEARCH APPROVAL

White, I. Lee

From: Hoag, Noni
Sent: Thursday, Aprill 11, 2002, 10:20 AM
To: Mills, Harold; White, I. Lee
Subject: FW: Notice of Approval for Research Requests by Lee White and Harold Mills
Importance: High

Hey, Harold and Lee,
This is what you have been waiting for! Congratulations!

Noni

---Original Message---
From: Schrankel, Steve
Sent: Tuesday, April 09, 2002 9:30 PM
To: Hoag, Noni
Subject: Notice of Approval for Research Requests by Lee White and Harold Mills
Importance: High

Noni, please inform Lee and Harold that the research committee reviewed their proposals. There were some concerns about the methodology and, in the case of the research on the Mathland implementation, concerns about the accuracy 0f subjects' recollections more than two years after the termination of Mathland. However, approval was granted. Letters of approval have been mailed by official mail. Lee and Harold may proceed with their dissertations, once they receive this e-mail notification from you.

Best wishes for success in their research endeavors.

Steve

Steve Schrankel, Ph. D.
Chief, Research and Evaluation Branch
DOD Education Activity
4040 N. Fairfax Drive
Arlington, VA 22203
Phone: 703.696.4471, extension 1968
e-mail: sschrankel@hq.odedodea.edu

APPENDIX I

INSTITUTIONAL REVIEW BOARD

APPROVAL FORM

Oklahoma State University
Institutional Review Board

Protocol Expires: 5/20/03

Date: Tuesday, May 21, 2002 IRB Application No: ED02117

Proposal Title: CURRICULUM IMPLEMENTATION: A CASE STUDY

Principal Investigator(s):

Martin Burlingame
203 Willard
Stillwater, OK 74078

Harold Mills
106 Willard
Stillwater, OK 74078

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive Secretary to the IRB, in 203 Whitehurst (phone: 405-744-5700, sbacher@okstate.edu).

Sincerely,

Carol Olson, Chair
Institutional Review Board

VITA 2

Harold Dennis Mills

Candidate for the Degree of

Doctor of Education

Thesis: CURRICULUM IMPLEMENTATION: A CASE STUDY OF MATHLAND

Major Field: Educational Administration

Biographical:

Personal Data: Born in Clinton, Massachusetts, on May 27, 1950, the son of Harold and Lorraine Mills.

Education: Graduated from Clinton High School, Clinton, Massachusetts in May 1969; receied a Bachelor of Science degree in Biology from Fitchburg State College, Fitchburg, Massachusetts in January, 1975, completed requirements for the Doctor of Education degree at Oklahoma State University, Stillwater, Oklahoma in August, 2003.

Experience: Worked as a quality control engineer for New England Nuclear Corporation in Billerica, Massachusetts; worked as a science, history, and mathematics teacher in Lancaster, Massachusetts; worked as an educator in the Department of Defense Schools for the past twenty years.

Professional Memberships: Phi Delta Kappa; International member of Association for Supervision and Curriculum Development; Overseas Education Association.