THE RELATIONSHIP BETWEEN DEGREE OF IMPLEMENTATION AND PERCEPTIONS OF ELEMENTARY TEACHERS REGARDING MATHEMATICS STANDARDS

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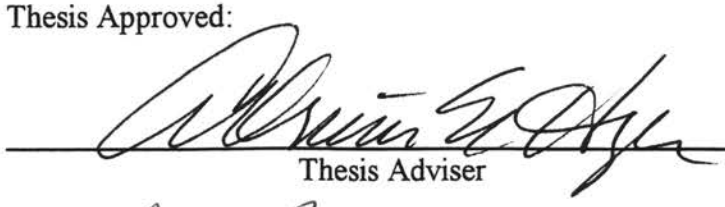

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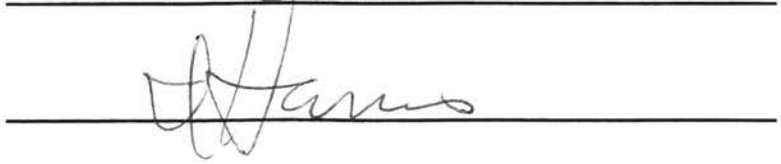

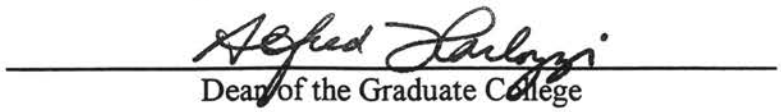

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TABLE OF CONTENTS

Chapter Page

Chapter Page

Chapter Page

Chapter Page

LIST OF TABLES

CHAPTER I

DESIGN OF THE STUDY

> *"Every movement is being inhibited as it occurs. This is nature's way. We can either work with it or work against it." (Senge, 1999, p. 10)*
>
> Educational change is everywhere. Never have so many schools and their teachers had to deal with so much of it. Responding to wide-ranging educational reform is an inescapable reality of teachers' work . . . Many of the changes are the result of policy demands and impositions for establishing standards-based reforms . . . (Hargreaves, 1997, p. vii)

Adopting and implementing curriculum standards in schools is both an historic and contemporary trend in education. "The notion of national standards for what students learn is the hottest item in education reform" (Lewis, 1995, p. 745). However, Brearton and Shuttleworth (1999) maintain that "the standards movement seems far removed from the classroom and the needs of students" (p. 30). They describe the standards movement as a fad that will fall by the wayside. Howe, in commenting on the standards movement, believes that "educators have a responsibility to challenge the public when it is headed in the wrong direction" (Howe, 1995, p. 22).

"Even without knowing the statistics, most of us know firsthand that change programs fail" (Senge, 1999, p. 6). However, Senge, senior lecturer at the Massachusetts Institute of Technology (MIT) and management innovation theorist, contends that "companies that fail to sustain significant change end up facing crises" (p. 6). He asserts

that businesses do not have a very good track record in sustaining significant change, and there is little to suggest that schools fare any better (Senge, 1999).

Why is it that successful and sustained educational changes in our nation's schools continue to elude us?

"Sustaining any profound change process requires a fundamental shift in thinking. We need to understand the forces and challenges that impede progress, and to develop workable strategies for dealing with these strategies" (Senge, p. 10). Effecting successful changes and bringing about desired results may lie not only in reexamining the change initiatives, but also the change process employed to implement them. Successful initiatives must also take into consideration the fundamental, human reaction to the implementation of change (Hall & Hord, 1987).

Senge asserts that profound change must combine "inner shifts" in people's values, aspirations, and behaviors with "outer shifts" in processes, strategies, practices, and systems. However, he continues, "failure to sustain significant change recurs again and again despite substantial resources committed to the change effort, talented and committed people 'driving the change,' and high stakes" (Senge, 1999). "The old way of managing change, appropriate in more stable times, does not work anymore" (Fullan, 1999, p. 3). Significant change invariably starts locally and grows over time (Senge, 1999). Senge posits that top-down driven initiatives will yield little notable change. He states, "Shared commitment to change develops only with collective capability to build shared aspirations" (p. 9). This basic premise can also be applied to new school initiatives and implementations.

The key to successful facilitation [of change] is to personalize one's interventions by focusing attention on the concerns of those engaged in the change process and accepting those concerns as legitimate reflections of change in progress. This contrasts sharply with the more instinctive tendency of managers to direct change from the perspective of their own concerns and objectives. Policy makers as well are known to reach decisions and to direct actions based on policy-level concerns, and they should at the very least adjust their expectations for results to take into account the concerns of those affected by the change (Hord, Rutherford, Huling-Austin & Hall, 1987, p. 90).

Background of the Problem

Children of American service personnel and the Department of Defense (DoD) support personnel stationed in overseas assignments have the option of attending Department of Defense Dependent Schools (DoDDS) to receive an American education. Most American citizens take full advantage of this opportunity overseas. The Department of Defense schools number approximately 150 in 11 districts including the United Kingdom, Italy, Belgium, Germany (four districts), Korea, Japan, and Okinawa. They also include the Turkey District, which extends to Spain, the Azores, and Bahrain. There is a combined total of 74,000 students, 6,000 teachers, and 400 administrators in these districts. The Department of Defense Dependent School System is one of the 10 largest American school districts, and certainly the most geographically dispersed.

DoDDS schools are located in 15 foreign countries and are unique in comparison to other American school districts. Despite the diverse cultural settings, DoDDS mirrors a strong image of its stateside counterparts. Certified teachers and administrators are

products of accredited United States colleges and universities, and students are, with few exceptions, products of the American public school system and the American cultural scene.

The DoDDS curricula are replicas of current educational trends in the United States. American commercially produced textbooks and programs are implemented to support the curricula. Extensive professional development activities and programs are offered worldwide by the Department of Defense Education Activity (DoDEA) headquarters in Virginia, as well as at area, district, and local levels.

DoDDS schools encounter many of the same concerns and challenges that other public stateside schools are faced with. Implementing new initiatives in schools is one such challenge in DoDDS. While some teachers implement new initiatives with great enthusiasm and determination, others prefer to continue teaching in their preferred style and choose to implement new programs to varying degrees. This is a significant challenge for an organization whose goal is to provide a world-class quality education for all students enrolled in the DoDDS system.

DoDEA published the document, Mathematics Standards and Expectations, in 1994. This school publication was based on the mathematics standards developed by the National Council of Teachers of Mathematics (NCTM). It provides specific guidance for DoDDS teachers of mathematics at each grade level. To complement these standards, new mathematics programs were selected for elementary and middle-level implementation. The new programs required a major change for teachers in terms of instructional preparation, practices, and assessment procedures. Programs were required to move instruction from the traditional emphasis on rote memorization of rules, procedures, and facts to thematic,

hands-on projects and real life investigations. To implement the standards, it was necessary for teachers to orchestrate student cooperative work groups with an extensive use of manipulatives to promote concept attainment.

In 1996, the superintendent of the Hessen, Germany district devised a proactive plan to ease the district into the dramatic departure from traditional teaching. A research study was designed to examine the effects of standards-driven program implementation on student performance. Change theorist, Gene Hall, was contracted to assist in the capacity of consultant to the project.

The implications of the Germany project enticed DoDEA headquarter officials to replicate and expand the study to DoDDS teachers of mathematics in grades three five, seven, and nine in Europe and the Pacific regions. During school year 1997-1998, the Office of the Associate Director and the Branch Chief for Accountability, Assessment, Research and Evaluation (AARE) initiated a research study entitled Systematic Linking of Instruction, Curriculum and Evaluation (SLICE). The primary purpose of SLICE was to identify components of the teaching of mathematics that are related to differences in student success. One particularly important aspect of this research was focused on reducing the achievement gap between students of different gender and ethnicities. A key expected outcome of the SLICE study was the identification of research-based content for professional development and support of teachers. Gene Hall also served as a consultant for the SLICE project. The roots and inspiration to pursue this dissertation evolved through affiliation with Gene Hall and the DoDEA worldwide SLICE research project.

Statement of the Problem

An historic and contemporary national trend in education is to adopt and attempt to implement curriculum standards to improve learning in schools throughout our nation's school districts (Berkson, 1997; Brearton & Shuttleworth, 1999; Cohen, 1995; Eisner, 1995; Foriska, 1998; Gandal, 1995; Jennings, 1995; Lewis, 1995; Ravitch, 1995; Tucker & Codding, 1998). Standards are designed by national professional and subject-matter organizations (e.g., American Association for the Advancement of Science [AAAS], Consortium of National Arts Education Associations [NAEA], International Reading Association [IRA], National Association for Sport and Physical Education [NASPE], National Center for History in the Schools [NCHIS], National Council of Teachers of English [NCTE], National Council of Teachers of Mathematics [NCTM], National Council for the Social Sciences [NCSS], National Research Council [NRC]), states or district policy setting bodies such as state legislatures or state or local school boards (Marzano & Kendall, 1997).

The adoption of curricular standards is typically the responsibility of the Board of Education in each school district, but the responsibility for the implementation of curriculum standards at the local level rests with classroom teachers (Hall & Hord, 1987; Fullan, 1991). Classroom teachers are typically not involved in decisions about curriculum, but are nevertheless charged with the implementation of mandated initiatives (Hord, et al., 1987). Because of this lack of involvement, teachers are reluctant to change current practices. This results in failed implementation of curriculum standards (Hargreaves & Fullan, 1998; Hord, et al., 1987).

Gene Hall's Concerns Based Adoption Model (CBAM) represents a conceptual framework for research and theory on change that explains this anomaly. CBAM is a unique lens for explaining the change process as it relates to the implementation of innovations. "All too frequently, innovations are 'laid on' teachers . . . The teachers are then left to struggle and discover through trial and error what the innovation is about and how to use it effectively" (Hall & Hord, 1987, p. 17).

There are three components of CBAM: *Stages of Concern About the Innovation*, *Levels of Use*, and *Innovation Configurations*. Hall maintains that use of the three components of CBAM greatly enhances the success of implementation of new innovations and initiatives (Hall & Hord, 1987).

> Because the CBAM model is client-centered, it can identify the special needs of individual users and enable the change facilitator to provide vital assistance through appropriate actions. This approach helps to maximize the prospects for successful school improvement projects while minimizing the innovation-related frustrations of individuals. (Hord, et al., 1987, p. 7)

Two of the dimensions of the Concerns Based Adoption model that are of particular importance to this study is the *Levels of Use of the Innovation* (LoU) and the *Stages of Concern About the Innovation* (SoC). The LoU offers a method of analysis of the interviews to determine the degree of standards-based curriculum implementation of each teacher. The SoC offers another lens to examine teachers' feelings and perceptions regarding the mandated DoDEA mathematics initiative. The LoU and SoC will provide the necessary data to examine the perceptions of elementary teachers' regarding the use of DoDEA mandated mathematics standards and the degree of implementation of the standards in their classrooms.

Purpose of the Study

Through the lens of Gene Hall's CBAM, the purpose of the study is to explore implementation of mandated change by classroom teachers. Specifically, this study will examine the degree of implementation of the DoDEA mathematics standards and perceptions of elementary teachers regarding the use of the standards. This purpose will be accomplished by the following:

- Documentation of classroom teachers' perceptions and activities in support of the implementation of DoDEA mathematics standards;
- Analysis of these perceptions and activities through Gene Hall's CBAM lens;
- Reporting of other realities that may be revealed; and
- Given this research, assessing the usefulness of the CBAM lens for exploring this phenomenon.

Orienting Theoretical and Conceptual Framework

CBAM is an empirically-based conceptual framework (Hord, 1986) which describes the developmental process that individuals experience as they implement new innovations. An outgrowth of ten years of research conducted at the Research and Development Center for Teacher Education (R&DCTE), at the University of Texas at Austin, CBAM is predicated upon six basic assumptions about the change process (Hord, et al., 1987):

1. Change is a process, not an event. A persistent and prevailing tendency in education is to expect change by mandating a program (an event). The recognition that change takes place over time – often years – is a significant step toward the successful implementation of an innovation.
2. Change is accomplished by individuals first, then institutions. Because change affects people, individuals must be considered if their role in the implementation is critical to its desired outcome. "Only when each (or almost each) individual in the school has absorbed the improved practice can we say that the school has changed" (Hord, et al., 1987, p. 6).
3. Change is a highly personal experience. Individuals react differently to change and, to promote a positive and productive implementation, their individual reactions must be taken into account. "Change will be most successful when its support is geared to the diagnosed needs of the individual users" (Hord, et al., 1987, p. 6).
4. Change involves developmental growth. As teachers progress through the change experience, they are likely to express their progress in terms of feelings and skills that fall into predictable stages commensurate with the degree of change.
5. Change is best understood in operational terms. Teachers relate to the demands of change in terms of what it will mean to them and how it will affect current conditions. By addressing these concerns in concrete, up-front terms, resistance can be reduced.

6. The focus of facilitation should be on individuals, innovations, and the context. The degree of implementation of any change initiative depends on the human element. For this reason, it is imperative that the emphasis on programs and materials does not overshadow the significance of the implementers.

The CBAM framework provides a comprehensive method of assessing the implementation of the change process through three separate but related dimensions:

1. Stages of Concern About the Innovation,
2. Levels of Use, and
3. Innovation Configurations.

"These dimensions represent a conceptualization of the way the concerns and behaviors of individual teachers change as they become familiar with and involved with these innovations" (Hord, 1986, p. 13).

Two dimensions of CBAM are designed to describe teachers as they first implement the change and then again as they gain experience with the innovation. These two dimensions, *Stages of Concern About the Innovation* (Hall, George & Rutherford, 1998) and *Levels of Use* (Hall, Loucks, Rutherford & Newlove, 1975), focus on the individual users of an innovation. *Stages of Concern About the Innovation* addresses teachers' perceptions, feelings and motivations relative to the innovation. *Levels of Use* behaviorally describes how teachers are approaching the use of the innovation (Hall & Hord, 1984).

Since neither of these concepts is designed to specifically define the innovation, a third dimension, *Innovation Configurations* (Newlove & Hall, 1998) was conceptualized.

The *Innovation Configurations* is a detailed description of the attributes of the innovation being studied in order to determine to what degree the innovation is implemented (Hall & Hord, 1987).

> Neither [of] these particular [three] dimensions . . . can make the extremely complex phenomenon of change clear and simple. Yet, the concepts and dimensions have proven to be of assistance to change facilitators, have offered a viable framework for understanding, facilitating and evaluating change efforts, and have made possible the posing of new types of research questions and examinations of policy. (Heck, Stiegelbauer, Hall, & Loucks, 1984, p. 7)

Procedures

This study is designed to examine top-down mandated change and the degree of implementation of the DoDEA adopted mathematics standards by classroom teachers. The use of Hall's CBAM conceptual framework model provides the structure to view teachers' perceptions of the mandated initiative through a specified set of assumptions and procedures. The nature of the problem lends itself to the qualitative research method. Merriam (1998) maintains that "qualitative research assumes there are multiple realities that are a function of personal interaction and perception" (p. 17), and the qualitative method "offers a workable rationale for performing significant research in human settings" (Erlandson, Harris, Skipper, & Allen, 1993, p. 9), like public schools. Through the naturalistic inquiry method, data is gathered, applications are made, new data is generated, and meaning is altered (Merriam, 1988).

The explanatory case study method of inquiry (Yin, 1994) was employed to gather information for this study. An explanatory case study generally seeks to answer the "how" and "why" questions; therefore, it is an "ideal design for understanding and

interpreting observations of educational phenomena" (Merriam, 1988, p. 2). The case study process allows for the development of a thick, rich description of the phenomenon under study (Creswell, 1994; Lincoln & Guba, 1985).

Researcher

A brief description of the researcher is included here to provide the reader with a glimpse of my background experiences and the beliefs and assumptions I espouse. I have been an educator all my life. As a child growing up in the Adirondack Mountains of Upstate, New York, I took particular delight in sharing knowledge with my four younger brothers. I always knew one day I would become a teacher.

My first teaching position was in a small, rural elementary school in central New York in 1972. It was wonderful to be paid for doing something that I loved doing so much. Three years later I moved to Germany to begin a two-year teaching tour with the DoDDS. The two years turned to 20 years almost overnight.

Throughout my tenure while stationed overseas, I have remained involved in the field of education in a variety of cultural settings including Germany, Italy, Japan, and the United Kingdom. I have taught all elementary school grades, consulted in middle and high schools, and served in a variety of other capacities such as a specialist, a consultant, demonstration teacher, coordinator for Gifted Education, and administrator. In my role as a school administrator in varied locations, I have served as an education program manager, assistant principal, and elementary school principal. I am currently a school principal employed by the Department of Defense in the United Kingdom. My many and assorted educational domestic and overseas experiences have broadened my perspective,

and afforded me the opportunity to grow as an educator and as an individual. I have been most fortunate in so many ways throughout my career.

My formal education includes an undergraduate degree in elementary education from the State University of New York at Oneonta, a Masters degree in Arts and Sciences in Gifted Education from the University of Southern Florida, and a Masters degree and Certificate of Advanced Study in Administration and Supervision from the State University of New York at Plattsburgh. During my tenure with DoDDS working in the United Kingdom, I joined a cohort of doctoral degree seekers sponsored by Oklahoma State University and have been most grateful for the opportunity to work toward a Doctorate in Educational Administration.

The issue of change is especially interesting to me since it is descriptive of who I am as a developing individual and educator. My diverse encounters in an assortment of leadership positions in an extremely transient society at overseas locations have been marked by change. My interest in this project was sparked when I was selected for involvement in the SLICE project and the CBAM training that ensued with Dr. Gene Hall in Colorado during the summer of 1998. Further training in CBAM was conducted to all school principals in the United Kingdom. I am appreciative to have worked with Gene Hall and to have been selected for the SLICE project training and data collection. The opportunity to work closely with Gene Hall; his statistician, Archie George; the project manager, Kristin Medhurst; and fellow researchers has been an honor and a privilege.

As a veteran an educator with over 20 years of experience, my repertoire of experiences in the field of education has continually broadened my viewpoint on the way people and things operate. In undertaking this research study, I am cognizant of some of

my personal biases that might affect my translation and analysis of data. My biases may color the lens through with I examine and explore the findings, conclusions, and implications of this research study. In my position as a school administrator for nine years, I have become intensely aware of the difficulties involved in implementing new programs and other school initiatives. I am certain I have developed some biases. My biases are a function of my background and prior experiences as an educator and leader, and include but are not limited to the following:

1. I believe that some teachers will resist change and new initiatives regardless of the benefits to students.
2. Resistance to change takes many forms and is displayed by teachers for a variety of reasons that include mandates and directives fashioned in clay tablets from the top of the organizational pyramid.
3. I think some individuals, believing they are incapable of change, are in fact choosing not to make changes, and consequently, behave in ways that they perceive themselves.
4. Decisions made collaboratively by all stakeholders have a greater possibility of commitment and success. When decisions are not research-based, there is less likelihood that long-term change will follow.
5. The process of change is very difficult for adults. The very nature of change implies that what has been done up until this point in time is less than satisfactory. In some cases it is.
6. Adults are capable of making change, though some individuals will take longer than a lifetime to willingly espouse and embrace change.

Methodological Implications

The biases described above may affect the collection, translation, interpretation and analysis of the data. For this reason it will be necessary to use various checks and balances to ensure validity and reliability (Merriam, 1998). I have tried to consistently employ proper qualitative procedures as a guide to my decisions and actions. Triangulation in the form of multiple sources of data (Denzin, 1970) provides a second source of validity. The analysis of data from multiple interviewees will reinforce discovered patterns and study findings. A verbatim transcript of each interview (McCracken, 1988) was prepared by a professional clerical worker in order to "eliminate familiarity with the data that does not serve the process of analysis" (p. 42). In addition, because of my biases, I will further safeguard the validity and reliability through peer review with a research colleague as well as through ongoing consultations with my adviser.

Data Needs and Data Sources

The purpose of this study is to explore the implementation of mandated change by classroom teachers using the conceptual framework of Hall's CBAM. To determine the degree of implementation and teachers' perceptions of mandated standards, data was needed from classroom teachers who were required to implement the standards. This information was provided through qualitative methods of research employing the focused interview process (Merton, Fiske & Kendall, 1956). To preserve the integrity of the researched-based model, prescribed questions from Hall's Levels of Use Interview

construct provided the basis for the inquiry. Transcriptions of recorded interviews furnished the data for later analysis.

This research was conducted through a random systematic selection (Erlandson, et al., 1993) of fifth grade mathematics teachers from the Department of Defense Dependents Overseas schools in the European and Pacific regions. All teachers represented in the study are fully certified educators who work directly with students on a daily basis in a regular classroom setting. After the initial selection, all participants were assigned an LoU rating commensurate with their degree of math standards implementation by certified CBAM evaluators. From the list of the total fifth grade teachers from the initial group of randomly selected teachers, a purposive sample (Patton, 1990) of 16 teachers was chosen as participants in this research study. The 16 selected teachers are representative of varying degrees of standards implementation.

Data Collection

Data gathered from focused interviews (Merton, Fiske & Kendall, 1956) conducted with a selected group of DoDDS teachers responsible for the implementation of DoDEA mathematics standards is the basis for this research. The data collection provided information that allowed for a rich, thick description (Erlandson, et al., 1993) to permit possible application, dependability, and transferability of the research findings (Lincoln & Guba, 1985). Multiple sources of data were provided by the interviews of the16 fifth grade mathematics teachers. The interviews provided the triangulation necessary to enhance internal validity and neutralize any bias inherent in the data, thereby seeking a convergence of results and adding to the trustworthiness of the study (Creswell,

1994; Lincoln & Guba, 1985; Merriam, 1998). Further triangulation and confirmability (Erlandson, et al.,1993) was sought by having another researcher provide an "audit" trail of important decisions made during the course of the research (Creswell, 1994, Lincoln & Guba, 1985).

Union and management officials held discussions concerning the SLICE worldwide research design at the headquarters level in Virginia (Appendix A). Administrative officials and the teachers' association reached an agreement regarding the purpose of the study and the participation of teachers in this study. This binding agreement served as both explanation and consent for the study. Interviewees were informed in advance in writing of their interview (Appendix B). Preceding each recorded interview, respondents were assured that their interviews would be kept confidential and remain appropriately secured. Participants were also informed that there would be no repercussions for their refusing to participate in the study.

Interview sessions lasted approximately 30 minutes. Participants were permitted to freely state their responses to the general and non-directive focused interview questions. Questions asked of the respondents were based on the original theoretical framework from the CBAM Levels of Use construct, thereby preserving the integrity of the model (Appendix C).

Official certification for permission to collect and analyze data on their personnel was issued from the Accountability, Assessment, Research and Evaluation (AARE) division of DoDEA (Appendix D). Prior to beginning this research, a proposal was submitted and approval was granted from the Oklahoma State University Research

Compliance department to obtain a waiver from the Institutional Review Board since data sets used for this research were generated by DoDDS (Appendix E).

Data Analysis

A review of the literature was conducted prior to and during the study. A comparison was made from emerging themes and issues in the literature and the data obtained from the focused interviews (Merton, Fiske & Kendall, 1956). Further research was conducted to clarify and interpret the incongruency if discrepancies occurred between the literature and the themes and issues emerging from the data.

To make sense of the research data, inductive analysis was used in this explanatory case study (Yin, 1994). In this qualitative study there were no hypotheses proposed, tested or proven. Through the process of constant comparison (Glaser & Strauss, 1967), categories surfaced and data were sorted according to their salient attributes to provide descriptive, inferential information that could be compared to formulate propositions (Lincoln & Guba, 1985). Relational statements from the respondents were categorized to provide a meaningful, congruent, and relevant explanation of the data.

Significance of the Study

Volumes of research exist on the issue of change as it relates to implementation. However, a limited amount of research is available on the topic of math standards implementation. There is currently no research available regarding teachers' perceptions of mathematics standards and the degree of standards implementation in DoDEA. This

research study is designed to contribute to the knowledge base regarding mathematics standards implementation in DoDEA schools.

Research findings from this study have potential for impacting educational practices regarding curriculum, staff development, school improvement, and school leadership. Examining teachers' perceptions on standards-based instruction provides valuable information for consultants, curriculum coordinators and staff developers who typically are responsible to implement new initiatives and innovations. Principals who are usually accountable for successful school-level implementations may also benefit from the implications of this study. The knowledge this research provides may enhance the efforts of local school and community improvement teams. Also, new knowledge on the implementation process may enable decision-makers, working in concert with teachers, to implement innovations more successfully.

According to Hall and Hord (1987), research using CBAM have focused on developing procedures and studies that would lead to an initial verification of various aspects of the model and on increasing the utility of the model for change facilitators. The results of this study should further serve those purposes, by clarifying and validating the usefulness of CBAM's conceptual framework on change. Findings and implications may be revealed through the application of Hall's CBAM construct to strengthen its importance as a lens for analyzing the impact of change on teachers. However, there exists the possibility that this research process may indicate that an alternate framework or combination of frameworks may be more advantageous in examining the interview data and literature on change as they relate to the DoDEA math standards implementation.

Summary

An overview of the national trend for implementing standards-based education in public schools has been presented in this chapter. The adoption of such changes in educational practice has traditionally remained the responsibility of the Board of Education and upper-level administration in each school district. However, the responsibility for the implementation of new initiatives typically rests with classroom teachers who are often omitted from direct involvement in the creation of the initiative. Consequently, failed implementations often result.

Successful change initiatives embrace the concept that "change is a process, not an event" (Hord, et al., 1987, p. 5). Change emanating from the local level in concert with the involvement of teachers must remain central in sustaining successful school change and improving the degree to which innovations are implemented (Senge, 1999; Hord & Hall, 1987).

This study focuses specifically on the implementation of the DoDEA mathematics standards by teachers in DoDDS schools located in the Europe and the Pacific regions. Data gathered from the LoU interviews of selected fifth grade teachers involved in the implementation were examined through the lens of the CBAM model of change. In this study, the impact of the implementation of the mandated mathematics standards in DODDS elementary schools will be analyzed with the aid of the CBAM theoretical construct.

Reporting

Chapter II presents a literature review of relevant research on change implementation along with literature on the standards movement. Data gathered from LoU interviews will be presented in Chapter III. Chapter IV will discuss an analysis of the data gathered. Chapter V, the final chapter, will present the summary, conclusions, implications, commentary, recommendations for further research, and an interpretation of the research findings.

CHAPTER II

REVIEW OF RELATED LITERATURE

"A foundational tenet of American society is that all children should have access to and be afforded a good education. To this end, most states across the nation have established academic standards to define what students need to know and be able to do at key points in their educational careers. Ideally these standards should set high expectations in order to challenge students to achieve to the best of their abilities" (Berman & Joftus, 1998, p. 6).

> The current revolution in mathematics education is the single most significant change in mathematics pedagogy since the New Math upheaval of the 1960s. Like its predecessor, the current reform movement is based on a firm belief that massive change is not only desirable but also urgently necessary. Reformers claim that current educational practices do not prepare students to do mathematics. (Tsuruda, 1994, p. ix)

Moreover, helping experienced teachers change the mathematics they teach and the ways in which they teach it is extremely difficult (Cohen, et al., 1990; Schifter & Fosnot, 1993).

> Public support for academic standards and the recognition of the need for "world-class," "high," or "rigorous" standards have steadily increased since 1989, when the first education summit was held in Charlottesville, Virginia, and the National Council of Teachers of Mathematics (NCTM) published the first standards document. Though there is widespread agreement on the need for rigor, there has not been agreement on what constitutes rigor. (p. 7)

However, more rigorous standards alone cannot guarantee higher student achievement and a world-class education for our children. Lacampagne discusses "state of

the art" mathematics as a goal that every school mathematics program in the United States should strive for. "It is a goal owed our children and it is attainable. State of the art mathematics depends on curriculum reform" (Lacampagne, 1993, p. 1).

A review of the research and literature that provides the foundation for this study will be presented in chapter two. In establishing a basis for the discussion on change and the implementation of standards, a review of the literature on the standards movement is included. Although the literature on standards contains relatively little research to draw from, there are many respected authors whose views will be presented to explore the significance of the standards movement and its implications for new implementations. Educators such as Robert Marzano, John Kendall, Lauren Resnick, Michael Huberman and Joe Murphy, and professional organizations such as the National Council of Teachers of Mathematics (NCTM), are included for their contributions to the standards-based literature and the insights they provide to this study.

Included in this chapter is a research review and detailed description of work by Gene Hall, Shirley Hord and Susan Loucks-Horsley on the implementation of change and the Concerns Based Adoption Model (CBAM). The presentation of pertinent literature on the CBAM model will demonstrate the relevance of this framework as the lens for examining the implementation of the Department of Defense Education Activity (DoDEA) mathematics standards in the Department of Defense Dependents' Schools (DoDDS). In addition, a review of current literature and research relating to the implementation of mandated initiatives is presented. Change theorists and researchers provide insight into teachers' resistance to change as it relates to implementing new innovations and initiatives.

Standards

Trends and Reforms

> The history of American education is, in large part, the history of recurring cycles of reform. There is considerable disagreement over the meaning and effects of these cycles. Reform has historically had little effect on teaching and learning in the classroom. (Foriska, 1998, p. 115)

> In the last two decades of the twentieth century, dissatisfaction with the performance of U.S. schools grew strong enough to permit serious consideration of major structural changes in American education. Perhaps the most striking initiative, because it departed so dramatically from tradition, was the bipartisan effort to create a national system of standards. (Ravitch, 1995, p. 1)

According to Education Commission of the States (ECS), the establishment of higher academic standards has greatly intensified pressures and expectations for schools to improve. This, coupled with a growing need to expand the kinds of educational and technological opportunities and experiences available to a growing number of culturally diverse students, dominates the reform movement.

The demands on public education are changing demographically, economically and politically. Policymakers now face major challenges in helping schools, educators and communities implement reforms to effect systemic changes (Education Commission of the States, 1997). "Current literature is filled with debate around the concept of standards" (Foriska, 1998, p. vi). Subject matter standards as a common core to the curriculum are new concepts in American education, and people, including many educators, are automatically skeptical of new ideas in the field (Gandal, 1995).

Definition

The dictionary definition of "standard" offers a large variety of meanings. Standards generally refer to something set up and established by authority as a rule for the measure of quantity, weight, extent, value, or quality. In education, a standard may also be defined as a criterion or yardstick to measure (Ravitch, 1995). Simply put, education standards identify what we expect students to know and be able to do. "Standards are statements that express what students should know and be able to do by specified points in their educational careers" (Berman & Joftus, 1998, p. 7).

Standards include the content we expect students to acquire, the skills we expect them to attain, and the intellectual qualities and habits of mind we expect them to develop. Standards set clear, visible target goals for performance and provide models of what good performance looks like (Albert & Jones, 1997; Burrill, 1997; Bybee, Ferrini-Mundy & Loucks-Horsley, 1997; Darling-Hammond, 1994; Kirst, 1994; Lippan, 1997; Porter, 1994; Ravitch, 1995; St. John & Pratt, 1997). Standards are a "preferred vision" of what is desirable in educational organizations (Foriska, 1998). "For educators, standards represent the highest vision of effective teaching and learning" (St. John & Pratt, 1997, p. 318).

States, districts and schools adopt their own curriculum standards and promote changes in teaching practices to reflect what is important for them (Burrill, 1997). "It is important for each nation to consider, and periodically reconsider, what it values in education" (Vukelich, 1993, p. 96). Standards are statements about what we value, and they define the valued outcomes of the system (Bybee, et al., 1997).

One of the dominant and persistent misconceptions about standards is that they are synonymous with curriculum. Standards indicate what students should learn, whereas curriculum is the way standards (content) is organized and emphasized. Curriculum includes structure, organization, balance, and presentation of standards (Bybee, et al., 1997).

History

> American education has a long history of standard-setting activity, sometimes overt and purposeful, at other times implicit and haphazard . . . Yet, despite this history of standard setting sponsored by various public and private agencies, never before has the federal government attempted to establish explicit national standards for what American children should learn in school. (Ravitch, 1995, p. 33)

The push to set more challenging educational standards was influenced by the Soviet Union's launch of Sputnik into space in 1957. Congress then decided to take a closer look at science and mathematics standards in the United States (Eisner, 1995).

The nationalizing of curricular content in the form of standards is high-stakes politics (Kirst, 1994). "Standards at both the national and local levels are political as well as educational documents" (St. John & Pratt, 1997, p. 316). Two events in 1989 prepared the way for the debate on national standards that would occupy the education agenda for the Bush and Clinton administrations, A Nation At Risk and a meeting of the governors of 50 states to establish national education goals (Ravitch, 1995, p. 56).

The 1983 report, A Nation at Risk, revealed that the skills and knowledge of the U.S. work force would have to rise dramatically for our nation to remain internationally competitive. "In concluding that education in the United States was unacceptably weak,

the authors of A Nation at Risk (National Commission on Excellence in Education, 1983) identified the primary cause as low standards" (Porter, 1994 p. 421). This document recommended a core curriculum to establish clear and high expectations for all students, but it did not recommend national standards (Ravitch, 1995).

A Nation at Risk was a blockbuster study that dwarfed all others in its influence on American education. "The rhetoric of the report was dramatic; it warned that the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our future as a Nation and a people" (Ravitch, 1995, p. 52). This critical document heightened interest in setting more vigorous goals and raising standards, and called for action throughout the nation to combat complacency and mediocrity (Ravitch, 1995).

In 1989, President Bush and the nation's governors assembled in the state of Virginia to address the problems in education. The movement for national standards began after an agreement in 1989 between President George Bush and the nation's governors to set national education goals with a target date of the year 2000 (Ravitch, 1995, p. 28). "The Bush administration's voluntary AMERICA 2000 plan spurred the creation of thousands of community-based organizations across the nation to work toward the goals" (Ravitch, 1995, p. 2). The adoption of ambitious national education goals by Congress that were seeded in the governors' meeting triggered nationwide debate on curriculum and national standards (Darling-Hammond, 1994). "Goals implied the need for some kind of national standards..."(Ravitch, 1995, p. 58)

The Clinton administration's Goals 2000: Educate America program provided states with federal funding to help establish internationally competitive standards for

students (Berman & Joftus, 1998). The Goals 2000 program was enacted into law in 1994 (Ravitch, 1995). Goals 2000 was an outgrowth of the Bush consortium that required states to establish clear standards for student achievement and to refocus their educational efforts around world-class standards (Gandal, 1995).

According to Foriska (1998), President Clinton's vision of systemic reform included national curricular standards as a crucial component. In his February, 1997 State of the Union Address, Clinton's GOALS 2000, a call for standards-based education, further heightened interest in the subject and spread it from the White House to virtually every home in the nation (Foriska, 1998). "President Clinton though he had a winner in his back-to-school-season campaign to create national academic standards. But his effort has not fared too well" (Collins, 1997, p. 75). The voluntary tests Clinton proposed met with strong criticism from conservatives. They argued that his proposal would bring too much federal control over education (1997).

"Education in the United States has always been a state and local responsibility . . . By law the federal government has not been allowed to supervise, control, or direct curriculum" (Ravitch, 1995, p. 31).

> Although the development of national standards creates a vision of education in a specific content area, the existence of national standards does not necessarily improve education or lead to systemic reform. State frameworks provide the needed guidance to transfer the national standards into actual classroom practice. (Wilcoxson, 1997, p. 311)

Large variations are seen in the ways states and districts actually pursue standards-based reform and the ways in which the national standards influenced their actions (St. John & Pratt, 1997).

Rationale for Standards

Professional education journals and newspaper articles are replete with editorials on the pros and cons of standards-based curricula. Some writers contend that implementing a national curriculum is the solution to what is plaguing American education and will reduce our lack of competitive edge in the world marketplace. E.D. Hirsch states that all students must have access to core knowledge to be successful in school, as well as in life. Hirsch also believes the national math standards established by the National Council of Teachers of Mathematics (NCTM) are quite consistent with his Core Knowledge curriculum (O'Neil, 1999).

According to Dennis Sparks, the executive director of the National Staff Development Council, the implications of standards for student learning are profound (Sparks, 1999). Even opponents of the national standards movement see some merit in them and believe the flaws can be ironed out (Lewis, 1995). According to Jennings (1995), the American public supports change in education when the change will make teaching and learning clearer in US schools. Every Phi Delta Kappa/Gallup poll since 1989 has found an overwhelming majority of citizens in favor of a national curriculum. Jennings further maintains that desirable changes in education can be achieved if states move to institute standards for their schools (Jennings, 1995)

Rothman (1997) contends that many educators would argue that a single curriculum naturally leads to student achievement gains. He further asserts that few educators would disagree that standards-based teaching leads to increased student achievement. Perhaps the best evidence of the positive effect of a system of standards-

driven instruction is in Kentucky. Under the 1991 Kentucky Reform Act, the state adopted the most comprehensive systemic effort to design education around student performance. Clear standards were developed and implemented throughout the state. After five years, significant improvements in student overall performance with gains of as much as 19 percent were seen (Rothman, 1997). However, other factors may have been reflected in these gains, such as an increased concentration on staff development and teacher sanctions and incentives.

Mathematics Reform

> Major curriculum reform is not new in the field of school mathematics. The last reform was the "new math" of the late 1950s and 1960s, which emphasized the unifying mathematical concepts of logic and set theory. For a variety of reasons the new math did not receive widespread acceptance. Specifically, it did not pay close attention to how students learn and what they are capable of learning at different ages. It also did not address what teachers know about mathematics and pedagogy or how they can best enhance their own knowledge. The new math was followed by the 'back to basics' movement which emphasized rote memorization of arithmetic facts and the learning of paper-and–pencil algorithms. The current reform movement grew out of the inability of the back to basics movement to address key issues including:
>
> - neglect of higher order thinking and problem solving skills
> - disquieting findings about American students in recent international studies on mathematics achievement, despite the return to basics
> - changing mathematical skills needed in the work force
> - new research findings on teaching and learning mathematics
> - mushrooming of inexpensive calculators and computers (Lacampagne, 1993, p. 1).

According to Tsuruda (1994), the heart of the new reform movement is the new way of looking at how kids learn. The revolutionary philosophy of constructivism

advocates that students understand mathematical concepts rather than memorize procedures.

> We now know a great deal more about how students learn and how the brain works. Recent research has shown that learning is the construction of knowledge and that it a very individual nature—it depends on the understanding and beliefs each person brings to the learning situation. (p. ix)

"Unfortunately, this ideal was translated into practice by simply asking 'Why,' within a fairly traditional math program" (p. 5).

Unlike some of our international competitors, the U.S. has never had a common set of education standards. Most likely this is because states have jurisdiction over what is taught under U.S. Constitution provisions. The release of current data from the 1999 International Mathematics and Science Study (TIMSS) has focused national attention on the relative standings of nations. Highlighted is the fact that the United States lags behind many higher-achieving countries in the field of mathematics (Reys, Robinson, Sconiers, & Mark, 1999).

> Constructive proposals for change in the typical U.S. mathematics curriculum and a litany of attacks on current reform efforts have proliferated, aided by the unprecedented access to the Internet, by discussions in professional journals, and by extensive coverage in other media. (Reys, et al., 1999, p. 454)

Rosenholtz (1989) maintains that the success of any organization is contingent upon clear and commonly defined standards and goals. A common focus clarifies understanding, accelerates communication, promotes persistence and unifies purpose. The hallmark of any successful organization is a shared sense among its members about what they are trying to accomplish, agreed-upon goals, and ways to attain them to enhance the organization's capacity for planning and action. In her research, Rosenholtz (1989) found

that schools are unique among organizations in lacking common goals. She believes the goals of teaching are multiple, shifting, and frequently disputed, and that this state of chaos became the rationale for the standards movement.

National Council of Teachers of Mathematics (NTCM)

According to the National Council of Teachers of Mathematics (NCTM), calls for reform in school mathematics suggest that new educational standards are needed in schools. All industrialized countries have experienced a shift from an industrial to an information society. This shift has transformed both the aspects of mathematics that need to be transmitted to students and the concepts and procedures they must master if they are to be self-fulfilled, productive citizens in the next millenium (National Council of Teachers of Mathematics, 1989). Foreign countries such as Japan, France, Sweden and the Netherlands are known for their outstanding math students and have several practices in common. Studies reveal that clear, consistent and demanding standards head the list (Resnick & Nolan, 1995).

> By the early 1990s much of the public recognized that higher levels of education than were necessary in the past would be needed in the twenty-first century and that American schools now expect more effort and higher levels of performance from all students. (Ravitch, 1995, p. 5)

And many of the actors in American education at the state and national levels had come to believe that national standards would help raise the quality of schooling for all students (Ravitch, 1995). In her writings, Wilcoxson (1997) quotes the National Research Council, "National standards provide a vision that enables us to move in the same direction with the assurance that we are supported by policies and practices throughout the education

system" (Wilcoxson, 1997, p. 311). "Confidence in national standard setting as a strategy for reform was enhanced by the success of the National Council of Teachers of Mathematics (NCTM) internally generated, profession-led activity to write curriculum standards" (Darling-Hammond, 1994, p. 492).

NCTM spent 10 years researching, developing and refining an extensive set of comprehensive math standards. The fundamental assumptions that underlie the NCTM standards are that by connecting mathematics to the real world, students are able to apply mathematics to real-life situations, and by connecting mathematics to other disciplines the interrelation and reliance on mathematics will be perceived by students. "The standards seek to change how students are taught mathematics so that they will, in turn, be provided a strong mathematics foundation that will enable them to meet the challenges of the future" (Price, 1996, p. 49).

In 1986, NCTM established the Commission on Standards for School Mathematics in an effort to address the deficiencies in mathematics education in U.S. schools. Over next three years the Commission developed the Curriculum and Evaluation Standards for School Mathematics (Lacampagne, 1993). In 1989, NCTM published the Curriculum and Evaluation Standards for School Mathematics (Curriculum Standards). "NCTM's long-range project was stimulated by a consensus among teachers that changes were needed in mathematics teaching" (Darling-Hammond, 1994, p. 492). Two other standards documents in mathematics surfaced after the original NCTM publication: Professional Standards for Teaching Mathematics (NCTM 1991); and Assessment Standards for School Mathematics (NCTM 1995), (Bybee, et al., 1997). The NCTM standards have been endorsed by groups representing the mathematics community from

kindergarten through graduate school, as well as by many other groups with a stake in mathematics education (Lacampagne, 1993). "The new standards imply fundamental shifts in the teaching and learning of mathematics toward a classroom environment that promotes the development of every student's capability" (p. 1)

Professional communities of mathematicians, scientists, educators, and teachers, with extensive input and review developed the national standards documents. Research about mathematics teaching and learning guided the standards development. The NCTM standards were intended to guide the revision of school mathematics and provide a broad framework to facilitate reform as opposed to being prescriptive (Bybee, et al., 1997). The motivation for the documents developed because NCTM leaders were seriously concerned about inequalities for students in terms of the quality of mathematics instruction and the direction of mathematics education in a changing world (Burrill, 1997).

NCTM (1989) maintains that there are three reasons for groups to formally adopt a set of standards: to ensure quality, to indicate goals, and to promote change. Standards are needed in school mathematics for all three reasons. However, mathematics curricula based on the NCTM standards are not in themselves panaceas. Nevertheless, studies on the impact of the NCTM standards-based curricula have consistently demonstrated that students using these curricula significantly outperform students who don't on measures of problem solving and reasoning. Teachers implementing the NCTM standards report numerous instances of students' growth in mathematical learning (Reys, et al., 1999).

The NCTM standards became the benchmark for other standards-setting commissions and projects (Lewis, 1995). According to a survey conducted by the Council

of Chief State School Officers in 1997, 46 of 50 states have created their own standards and indicate that these standards are aligned with the NCTM standards (Burrill, 1997).

Everybody Counts, A Report to the Nation on the Future of Mathematics Education, published in 1989 by the National Research Council (NRC), states that reform efforts in mathematics education require the voluntary implementation of common national standards. The report suggests that school mathematics programs should share a common philosophy and framework, a universal set of interrelated concepts and methods, all held together by a simple workable philosophy. Yet they must be flexible enough to allow for local and regional variations. The report maintains that "changes in mathematics curricula must be proposed and undertaken freely by those who bear direct responsibility for curricula in the schools" (National Research Council, 1989, p. 91). "Both for reasons of international competitiveness and scientific leadership, the US must move quickly to affect changes to improve the state of mathematics education. It takes a generation to complete the mathematical education of a single individual" (NRC, 1989, p. 96).

In the 1994 position paper, NCTM discussed mathematics education for children of elementary school age. NCTM's position on elementary mathematics included the following statement:

> Young children enter school having a natural interest, curiosity, and an eagerness to learn. As children move through the elementary school level, educators build on these attitudes, which support children's mathematical development. By connecting mathematics with real-life experiences, educators can help children not only understand mathematics but see its value and usefulness. (NCTM, 1998, p. 26)

In a summary article by Betts and Walker (1995) in the ASCD Curriculum Handbook, they state, "Research indicates that students learn computation better when

they work in a flexible context of solving real problems and explaining mathematical processes." A description of what elementary school mathematics programs should include are described in the ASCD handbook:

- For students in grades K-4: the mathematics curriculum should develop whole number computation so that students can: use basic algorithms with proficiency, use mental computation and estimation techniques, use calculators in appropriate computational situations, select and use computation techniques appropriate to specific problems and determine whether the results are reasonable.
- Grades 3-8: Technological developments are not only changing the mathematics we know, they are changing the way we come to know mathematics. These changes in mathematics and mathematics teaching require: appropriate availability and use of calculators, computers as tools of investigation, processing information, and problem solving.

In his discussion of elementary school mathematics, Steen maintains,

> Mathematics teachers, especially in grades 5-9, need to broaden their goals to encompass more than just the narrow arithmetic-algebra track that has historically dominated U.S. mathematics programs. In particular, they need to vigorously develop several; parallel (and highly interconnected) strands of quantitative thinking: higher arithmetic, measurement geometry, data analysis, mental arithmetic argument and persuasion reasoning, chance and risk, finding unknowns. (Steen, 1999, p. 12)

Summary

"As society examines the values, processes, and problems of popular education, a particular hallmark of the period since the 1980s has been standards-based reform"

(Bybee, et al., 1997, p. 332). National standards are a starting point for states and localities to define their own curriculum frameworks for schools. National standards based on traditional subject matter disciplines will narrow the curriculum, set priorities, and ensure that students have equal educational opportunities (Ravitch, 1995).

> Reform in mathematics education has been stimulated and propelled by the publication of standards documents by NCTM. A vision of a powerful mathematics education for all students to meet the challenges of the twenty-first century is articulated in the NCTM standards documents. (Lappan, 1997, p. 207)

Standards-based reform is a highly personal process and is very dependent on a number of variables including the strength of local leadership in schools (St. John & Pratt, 1997). "National standards, however clear and motivating they may be, do not automatically 'get implemented.' Rather, they become the center of a set of policies and processes..." (p. 316). Policy does not always give rise to practice, and the ways in which the national standards in mathematics are actually used are divergent and complex (St. John & Pratt, 1997).

Teacher Implementation of Innovations

> A significant body of circumstantial evidence points to a deep, systemic incapacity of US schools and the practitioners in them, to develop, incorporate, and extend new ideas for teaching and learning in anything but a small fraction of schools and classrooms. (Elmore, 1995, p. 1)

"Responsibility and authority for implementation do not necessarily lie with the organizations that developed standards. Teachers assume major responsibility for implementation" (Bybee, et al., 1997, p. 328). Why do new implementations and innovations strike terror into the hearts of some individuals? The literature on change is

replete with studies and theories that support the basic belief that human beings will resist change.

History of Top-Down, Mandated Change Implementation

Enormous amounts of money were spent on new ventures such as open schools and individualized instruction in the 1960s. These expensive top-down initiatives were expected to produce favorable results for children. However, the realities did not match the vision and the projects proved not to be cost effective or lasting. In the 1960s, the word "implementation" was not yet used in reference to education, nor was it ever considered a problem to surmount (Fullan, 1993).

The first major studies of failed educational implementation were witnessed in the 1970s (Goodlad & Klein, 1970; Gross, Giacquinta, & Berstein, 1971; Sarason, 1971). The effective schools movement followed this era and brought with it some evidence that schools can make a difference. By 1980, studies on implementation successes and school improvement efforts provided new knowledge concerning the implementation of innovations. However, these successes were isolated and limited in consideration of the problems in education (Fullan, 1993).

The aftershocks of the release of A Nation at Risk in 1983 resulted in large-scale governmental action in the form of top-down regulations, including mandated state curricula (Elmore, 1995; Murphy, 1991). In the mid-1980s, restructuring emphasized decentralization and contributed to a "combination of bifurcation and confusion" (Fullan, 1993, p.2). Two camps developed, the centralists who promoted greater top-down regulation, accountability, and control of the educational establishment, and the

restructionists who advocated greater control by local school teachers and other educators (Fullan, 1993).

Reform in the new millennium, is perceived as "too important to leave to educators" (Fullan, 1993, p. 3). Government and businesses have entered the educational arena, both with vested interests in the schooling of our youth. Businesses already lament the lack of prospective employees (Steen). The twenty-first century brought never-ending and complex change. Juxtaposing the notion of change onto a highly conservative educational system results in an organization most likely to foster the status quo and avoid change (Fullan, 1993).

> When change is attempted under such circumstances it results in defensiveness, superficiality or at best short-lived pockets of success. . . . You cannot have an educational environment in which change is continuously expected, alongside a conservative system and expect anything but constant aggravation. (1993, p. 3)

"The 'command and control' notion of leadership seems to live on as school leaders too often assume that it's sufficient to hand out standards and tell teachers to implement them" (Sparks, 1999, p. 3).

Resistance to Change Implementation

> The original meaning of the old French word changer was "bend," or "turn," like a tree or vine searching for the sun. The idea that "the only constant is change" has been a truism of life since at least the time of Heracleitus, circa 500 B.C. Today, in organizations, the word "change" means several often contradictory things. . . . Because change programs are typically imposed from the top, many in the organization feel threatened or manipulated by them – even if they support in principle the intent or rationale behind the management change agenda (Senge, 1999, p. 14).

"Teachers see standards as additional top-down and mandated constraints. . . . The teachers we interviewed scoffed at the general notion that it is their job to implement standards" (St. John & Pratt, 1997, pp. 319-320). Although desire for change may vary dramatically among teachers, top-down mandated change is rarely well-received (Ashton & Webb, 1986; Hopkins, 1990; McKibbin & Joyce, 1980; Rosenholtz, 1989). Policy makers have lost sight of the fact that "the teacher is mediator between the knower and the known, between the learner and the subject to be learned. A teacher is the living link in the episotological chain" (Palmer, 1983, pp. 29-30).

Champlin challenged educators with his belief that, "We must always understand that vision is made into reality through people. If the vision for an organization is to become a reality, all organization members must share in it" (1993). Lacampagne (1993) maintains,

> . . . systematic change cannot occur unless the members of the learning team – students, parents, teachers, school administrators, and policymakers – are also key participants in the process. Past reform efforts have died out because the whole learning team was not involved.

Teacher commitment is one of the most significant barriers to reform that can weaken or destroy implementation efforts (Protheroe, 1990). The effectiveness of a program is largely determined by the willingness of the members of the school to undertake the particular reform (1990). "A faculty member's refusal to pay more than lip-service to any promising initiative . . . affects the level of implementation of the entire program" (p. 99).

Local capacity has long been recognized as central to the implementation of instructional reforms (McKaughlin, 1987). Teachers of mathematics must perceive that

they are key factors in the effort to reform mathematics (Blosser, 1984; Fullan, 1982; Koballa & Crawley, 1985). According to Foriska (1998), this occurs when staff members develop a sense of ownership in improvement efforts, when there is collaboration and shared decision making in concert with program development. As a result, "staff ownership of new programs and new ways of thinking about education result in institutionalized changes that can lead to improved services for students" (Foriska, 1998, p. 10).

Resistance is a natural condition of life in an organization. However, new approaches and different ways of thinking can be perceived as a loss of control. Change can also bring with it excess uncertainty, the memory of past resentments, and concerns about future competence. The natural tendency is for the organizational culture to dismiss approaches that will change the status quo. There is little tolerance for actions that attempt to demand change (Foriska, 1998). If teachers are expected to change their practice, then it makes sense to involve them from the onset and to encourage teachers to lead the project (Wilcoxson, 1997).

> School communities must undertake their own hard work on standard setting and consensus development if they are to become committed to and knowledgeable about change. . . . Teachers must be the cornerstone of any systemic reform directed at improving our schools. (Darling-Hammond, 1994, p. 478)

Barriers

At a summer Benjamin Banneker Association leadership conference in 1997, one of the working groups identified barriers to adopting standards-based instruction. The list of impediments to change included: lack of teacher preparation, poorly prepared

preservice teachers, financial inequities, lack of necessary materials, lack of access for students (tracking), unqualified and minimally qualified teachers in mathematics classes, lack of access to technology, labeling products "standards based" when in fact they are not, lack of understanding on the part of politicians, and teachers not held accountable (Burrill, 1997). "To have real change for all students, we must look for ways to eliminate these barriers. . . . Change takes time, resources and support" (1997, p. 339).

Time and Energy. An enormous amount of learning time is required for most educators to implement mathematics standards. Lappan (1997) was not surprised to find that time was a crucial resource in Local Education Authority (LEA) mathematics and science reforms. He states that most educators will need extraordinary amounts of time to: learn the knowledge required to enact these reforms; understand the reform ideas and figure out what they might mean for their existing practice; create opportunities for administrators and teachers to learn about the ideas; engage the reform ideas and come to understand how they might reshape their existing practice around these ideas; and reflect on their attempts at carrying out these reforms (Lappan, 1997, p. 225).

This phenomenon is referred to as "adequate time to learn new roles" by Protheroe (1990, p. 106). Even new resources require that long-term, routine practices be adjusted. "These changes can be disconcerting or overwhelming to some members of the school community; even with broad support, new initiatives can be tricky to coordinate smoothly" (p. 107).

Patterson (1997) argues that not only time, but also energy is a prime commodity for teachers. Because the energy to initiate change is finite, teachers make conscious and

unconscious decisions to either take energy away from other pursuits and invest it in the new innovation, or to apply their energy to areas that give them greater gains. Fullan (1991) suggests that in order to help teachers make such decisions, policy makers must answer the question every teacher is asking about an innovation: "Why should I put my efforts into this particular change," (p. 127). Fullan posits four main criteria for determining teachers' "buy-in" to implementing change:

1. Does the change potentially address a need? Is there evidence that the change works – that it produces claimed results?
2. How clear is the change in terms of what the teacher will have to do?
3. How will it affect the teacher personally in terms of time, energy, new skill, sense of excitement and competence, and interference with existing priorities?
4. How rewarding will the experience be in terms of interaction with peers or others. (Fullan, 1991, p. 128)

Support. "The introduction of standards without accompanying support is a sure sign that the reform process underway is political, not educational" (St. John, & Pratt, 1997, p. 320). Standards-based instruction commands major changes for most classroom teachers. The standards require a fundamental shift in what it means to teach -- to enable students to learn, not just to present information (Ravitch, 1995). "To make the shift to standards-based teaching, teachers will have to change their definition of 'good class,' their teaching philosophy, classroom management skills, lesson planning, preparation, and

assessment procedures" (Gibbons, Kimmel & O'Shea, 1997, p. 303). "In order to adjust, teachers need long-term support, more intense content preparation, and professional development that is tied to their teaching" (Burrill, 1997, p. 336).

New forms of pedagogy and the adoption of constructivistic instructional practices in concert with new implementations pose a considerable challenge in terms of professional development.

> There is a need to begin at ground level and build teacher support systems that can educate and assist teachers in changing their minds and their practice to encourage more powerful mathematics and mathematical thinking for students. Many teachers have never experienced learning mathematics in situations where value is placed on the quality of the thinking, the quality of explanation or argument, and the quality of decisions made based on the evidence. In addition, many teachers have little experience using tools – intellectual as well as physical tools – as ways of modeling, exploring, or representing ideas in mathematics. (Lappan, 1997, p. 230)

To examine professional development programs for their potential in helping teachers move toward more authentic teaching of mathematics, it is necessary to address two strategic needs. First, a template or organizational structure of what teachers need to know and be able to do must be devised. The creation of such a template was the task of the Commission on Teaching Standards of the NCTM as they began to develop the Professional Standards for Teaching Mathematics (Lappan, 1997). Second, more time and attention must be devoted to the implementation phase including addressing staff concerns and meeting their needs for ongoing support and training.

> Staff development must happen in a manner that corresponds to the development of the organization. Participants are involved in analysis, collaboration, and conflict resolution as decisions are made on how best to meet all needs so that the vision of the organization can be attained. (Foriska, 1998, p. 17)

The team concept can have a tremendously positive impact. According to Schmoker (1996), schools would perform better if teachers work in focused, supportive teams, and more could be accomplished through team problem solving than by individuals working in isolation.

Plans for implementation should evolve from a team. The team concept allows staff members to develop ownership for the innovation during the change process. The team concept also conveys to the staff the message that they are not working in isolation. This is a vital element because it is known that student success is going to hinge on what happens at the classroom level (Foriska, 1998).

Summary

Reform will not occur unless classroom teachers are willing to change what happens in the classroom, and unless the school administrator and school district support these changes (Wilcoxson, 1997). Fullan (1993) argues that there exists a deeper reason to build capacity for change in educators. He advocates the espousal of a moral purpose, a purpose that aspires to make a difference in the lives of all students, to enable them to live and work productively within the demands of increasingly complex societies.

> What is new . . . is the realization that to do this puts teachers precisely in the business of continuous innovation and change. They are, in other words, in the business of making improvements, and to make improvements in an ever-changing world is to contend with and manage the forces of change on an ongoing basis. (Fullan, 1993, p. 4)

Society expects its citizens to demonstrate the capability for dealing with change both individually and collaboratively.

> Of all the institutions in society, education is the only one that potentially has the promise of fundamentally contributing to this goal. Yet, education, far from being a hotbed of teaching people to deal with change in basic ways, is just the opposite. (Fullan, 1993, p. 5)

Positive changes in education can be affected when educators view themselves and those around them as experts in the dynamics of change. This requires educators to become skilled change agents. "If they become skilled change agents with a moral purpose, educators will make a difference in the lives of students from all backgrounds, and by so doing help produce greater capacity in society to cope with change" (Fullan, 1993, p. 5).

Time, energy and support are commodities that must be coveted in consideration of the change process. Staff development must be carefully orchestrated to provide the support educators will require when new innovations are implemented.

The Concerns Based Adoption Model (CBAM)

"Systemic change happens only when the people inside a school critically examine their fundamental organizational beliefs and change their practices to fit their revised beliefs" (Patterson, 1997, p. 4).

> Change is a highly personal experience – each and every one of the teachers who will be affected by change must have the opportunity to work through this experience in a way in which the rewards at least equal the cost. (Fullan, 1991, p 127)

> In the 1970s, early CBAM innovators attempted to define the simple yet complex notion of change implementation by examining the educational innovations whose value was in question at the time. It became increasingly apparent that the post hoc evaluations of the many educational innovations were only half-correct. Evaluators were right to report "no significant difference" related to the innovations, but incorrect to conclude that the innovations were at fault; rather, we believe that the process of

> implementing these innovations had gone awry or was not fully addressed. Consequently, innovations were frequently not fully implemented and therefore, not fairly tested. (Hall & Hord, 1987, p.7)

Hall's CBAM construct provides a structure for examining change as it relates to implementations and those individuals who are tasked with the responsibility for making the changes. "As we look at the new directions in mathematics education, we should consider planning for change in light of the application of the concerns-based approach" (Gann, l993, p. 287). CBAM also provides information to support teachers as they implement new innovations.

Two dimensions of the CBAM model are of particular importance in this study. The Levels of Use of the Innovation (LoU) research provides the framework for the standardized interview process. The LoU also offers a method of analysis of the interviews to determine the degree of mathematics standards implementation of each participant in this study. The *Stages of Concern About the Innovation* (SoC) provides information and a basic lens for examining the interviews. It "addresses how teachers or others perceive an innovation and how they feel about it. . . . [both] dimensions represent key aspects of the change process experienced by individual users" (Hall & Hord, 1987, p. 13).

Levels of Use (LoU) of the Innovation

> The Levels of Use (LoU) dimension of the CBAM construct focuses on the behaviors that are or are not taking place in relation to the innovation . . . Levels of Use can serve as a valuable diagnostic tool for planning and facilitating the change process. (Hall & Hord, 1987, p. 81)

The LoU allows us to examine implementation not as an "either-or" phenomenon, but as a continuum of defined stages. A structured interview (Appendix C) is used to collect data

to determine an individual's level of implementation of an innovation. Levels range from non-use, through mechanical, to refinement (Loucks, et al., 1998). It is significant to know a teacher's level of use of an innovation since it is not until the teacher advances into the refinement level, that adaptations are made to the innovation that positively affect student achievement (Borchardt, Hall & Hord, 1996).

The LoU describes the behavior of individuals, as they become more familiar with and more skilled in using an innovation. Each of the eight identified levels focuses on behavior that is characteristic of the innovation user at a particular stage of development. The model proposes eight discrete levels of use of an innovation that an individual may demonstrate. Levels range from lack of knowledge that the innovation exists to an active, sophisticated, highly effective use, to an active searching for a "superseding innovation" (Hord, 1987, p. 56). It is further hypothesized by CBAM researchers that:

> Growth in quality of use of an innovation (movement toward higher levels) by most individuals is developmental. Normally, individuals do not use an innovation for the first or even the second time as effectively and efficiently as they do after four or five cycles of use. Each level encompasses a range of behaviors, but is limited by a decision point that denotes actions that move the individual to the next level. For example, when a person experiences some initiative to learn about an innovation, he or she has reached decision point A and moves from level 0 to 1. (p. 56)

A brief description of the Levels of Use About the Innovation (LoU) is presented below:

- LoU 0: Non-User of the Innovation The individual has little or no knowledge of the innovation, no involvement with it, is making no effort to learn more about it, and does not plan to use the innovation. The absence of any action toward use of the innovation signals a level zero use.

- LoU I: Orientation. Individuals are taking the initiative to learn more about the innovation and indicate that they will probably use it in the future. No time has been established for beginning the use.

- LoU II: Preparation. A decision to use the innovation by an established time has been set. Individuals are taking steps to get ready to begin for a first time use, and have not actually started to implement the innovation.

- LoU III: Mechanical Use. Individuals at the mechanical use level have used the innovation and are engaged in attempts to master tasks involved in the innovation. The user focuses on the short-term, day-to-day use of the innovation. The user is aware of how the program should ideally work, and attempts often result in disjointed and superficial use. It is not atypical for teachers to remain at this level for quite some time as they struggle with the logistics of a new program.

- LoU IVA: Routine. Individuals at this level have reached a stabilized or routine use of the innovation and intend to make few if any changes in ongoing use. Little preparation or thought is given toward improving the innovation or its consequences. Once an individual reaches the routine LoU it is not uncommon to remain there for an extended time, making only minor adjustments in patterns of use.

- LoU IVB: Refinement. When individuals begin to modify the program within their immediate sphere of influence they are functioning at the refinement level. The program variation is based on formal or informal evaluation for the benefit of clients (students), and uses knowledge of both short and long-term consequences for students in making modifications. If, however, changes are made to accommodate a management problem or make the day more manageable, it would reflect a LoU III.

- LoU V: Integration. Individuals who reach the integration level have decided on their own to collaborate with others within their common sphere of influence. They believe that by doing so they can provide better learning experiences for their students. LoU V is determined by two key variables: collaboration between two or more persons and changes in use of the innovation for the benefit of clients. The collaboration must be regular, not causal conversation every couple of weeks. Because most teachers tend to work as solitary craftsmen, the number of persons at LoU V is typically small.

- LoU VI: Renewal. Ideas for exploring alternatives to or making major changes in the use of the innovation are characteristic of the renewal level. The user reevaluates the quality of use of the

> innovation at this level. The reasons for the changes are client-centered, and involve what the teacher feels students need to improve their learning. It is important to note that although the teacher is thinking about, talking about, and planning these changes, they have not occurred. (Hord, et al., 1987)

If an individual at the LoU VI level makes the proposed changes to the innovation the individual "will probably be dealing with another innovation and his LoU will recycle based on that innovation" (Hord, 1987, p. 58).

The LoU dimension describes the various behaviors of the innovation user through the eight stages – from spending most efforts in orienting, to managing and finally to integrating use of the innovation. Before actual use, individuals become familiar with and increasingly knowledgeable about the innovation. The first use is typically disjointed and management problems are quite common. With continued use, management becomes routine, and the teacher is able to direct more effort toward increased effectiveness for the students. Reaching the more advanced levels of use are not attained merely by using the innovation only a few times. Experience is essential, but not sufficient to insure that a given individual will develop high-quality use of an innovation (Hall & Hord, 1987).
The LoU dimension is targeted toward describing behaviors of innovation users and does not at all focus on attitudinal, motivational, or other affective aspects of the user. "The dimension does not attempt to explain causality. Instead, the LoU dimension is an attempt to operationally define various states of innovation user behavior, i.e., what the user is doing" (Hall, et al., 1975, pp. 5-6).

Levels of Use Interview

The focused interview is used to measure an individual's Level of Use of an innovation. This procedure employs an interview guide with a list of questions, but gives the interviewer latitude within the framework of the interview guide (Merton, Fiske & Kendall, 1956). In the LoU interview, specific standardized questions are required since they have been found to be effective and efficient in eliciting the necessary information. The interviewer must be intimately knowledgeable of the objectives of the interview and is often required to use judgment in the sequencing of these questions, as well as in pursuing insufficient responses with further probing (Hord, et al., 1987).

A focused interview, rather than a highly structured interview (one that required standardized questions, probes and procedures), was based on several considerations. Although the LoU interview does require a standard set of questions, the LoU concept is too complex to expect that probes and follow-up questions can be completely without variation and still be appropriate for every situation. As Maccoby and Maccoby (1954) note, less structured interviews allow for standardization of meaning rather than relying on the same words to mean the same thing to each interviewee. Interviewers respond differently in extent, as well as content, and for the objectives of the interview to be met, follow-up responses must be individualized. Less rigidity also encourages more true-to-life responses since the respondent can follow a natural train of thought. Thus, more complete and detailed responses are obtained. "The amount of freely provided and important information that has been obtained through over 1,680 LoU interviews supports the belief

that the selection of this interview procedure was well made" (Loucks, Newlove, & Hall, 1998, p. 2).

Relying chiefly on the self-report of an individual may not give a comprehensive and accurate illustration of that individual's behavior. To compensate for this potential weakness, the Level of Use interview has been developed in such detail that questions can be asked about various independent, yet related behaviors that contribute to establishing an individual's overall LoU. Maccoby and Maccoby (1954) maintain that if a number of questions are asked that differ in form and content, but are related in a predicted meaningful or logical fashion (as they are through operational definitions of the LoU), then a high correlation between responses to these questions indicates that they reveal a common characteristic of the individual. "It has been found in LoU research that an individual's responses to the interview questions are highly correlated, and therefore, it can be assumed with a high degree of certainty that they measure what they purport to measure, Level of Use of the Innovation" (Loucks, et al., 1998, p. 3).

> Change does not occur easily or quickly. As a general rule, 60 to 70 percent of the first-year users of an innovation will be at the mechanical level. Unless the innovation itself calls for collaboration among users, few will reach the integration level. (Hord, et al., 1987, p. 66)

"People need each other's knowledge to solve problems. The motivation to share and the opportunity to access information requires ongoing interaction" (Fullan, 1999, p. 3).

> Even fewer reach the renewal level. Those who do may not remain there long. When they act on their ideas they usually create a new innovation for themselves and their LoU will recycle [to a lower LoU] based on that innovation. (Hord, et al., p. 66)

> We cannot assume that people will adopt an innovation just because it has been introduced. Research conducted in hundreds of schools and involving many innovations has revealed that it is quite common to find at least 20

> percent of the teachers in any school who are non-users even in the second and third years of implementation. Often the percentage of non-users is much higher. (p. 66)

Stages of Concern (SoC) About the Innovation

There is a set of developmental stages teachers move through as they become increasingly sophisticated and skilled in using new programs and procedures (Hall & Hord,1987). The SoC dimension of CBAM focuses on "the feelings, thoughts and information needs of the innovation user" (Loucks, et al., 1998, p. 1). It addresses the notion that teachers located in the "I" centered stages are not able to concentrate their efforts on students' needs through innovation modification (1998). When individuals are introduced to an innovation, they are preoccupied with wondering what it will require of them and how their roles will change. "As these concerns are resolved, more task-oriented concerns emerge. Questions about what materials are needed daily and how to schedule time more effectively are typical" (p. 1). In the later stages, concerns focus on how the innovation affects students, how to collaborate efforts, or even how to enhance student learning by replacing the innovation (Hall, et al., 1998).

CBAM research describes seven progressive Stages of Concern. The Stages of Concern are listed in three categories and consist of the following (Hord, et al., 1987):

Self Concerns

0. Awareness: Little concern about or involvement with the innovation is indicated.

1. Informational: A general awareness of the innovation and interest in learning more detail about it is indicated. The individual seems to be unworried about self in relation to the innovation. The individual is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.
2. Personal: The individual is uncertain about the demands of the innovation, his/her level of adequacy in meeting those demands, and his/her role with the innovation. This includes analysis of one's role in relation to the reward structure of the organization, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.

Task-Oriented Concerns

3. Management: Attention is focused on the processes and tasks of using the innovation and the best use of the information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are of primary importance.

Impact Oriented Concerns

4. Consequence: Attention focuses on the impact of the innovation on students in one's immediate sphere of influence. The focus is on the relevance of the innovation for students, evaluation of student outcomes,

including performance and competencies, and changes needed to increase student outcomes.

5. Collaboration: The emphasis is on coordination and cooperation with others regarding use of the innovation.

6. Refocusing: The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. The individual has definite ideas about the existing innovation or proposed alternatives.

"While the seven Stages of Concern are distinctive, they are not mutually exclusive. An individual is likely to have some degree of concern at all stages at any given time . . ." (Hord, et al., 1987, p. 30). The first stage, Awareness, characterizes a person who has little, if any, knowledge about the new innovation. The remaining six stages represent three general categories of concerns:

- Self–Concerns (stages 1 and 2) are reflective of teachers who are asking, What is this new change and how will it affect me?
- Task-Oriented Concerns (stage 3) are representative of teacher queries such as, How do I implement this change? What do I need to do to make this change happen with my students?
- Impact-Oriented Concerns (stages 4-6) include teachers who are asking, How are my students learning? Are they learning more and are they learning better? How do I work with others who are also implementing these new ideas? (Gann, l993, p. 289)

Stages of Concern appears to be a developmental process since earlier concerns must first be resolved or lowered in intensity before one moves on to another level. Research suggests that this developmental pattern is applicable for most process and product innovations (Hall, et al., 1998). It is also significant that the advancement of teachers to higher levels of concern is not simply engineered by an outside force. The individual owns the stage of concern and therefore, the change comes from within.

> There is no guarantee that arousal of higher stage concerns will follow the reduction of lower stage concerns. . . . Whether and with what speed higher level concerns develop will depend on the person as well as the innovation and the environmental context. (p.6)

Summary

The CBAM construct supplies a framework for examining the change process as it related to the adoption of new innovations. The LoU is particularly useful in identifying the degree of implementation of an innovation from teacher interviews. The SoC dimension provides information concerning teacher perceptions of the innovation. Both dimensions provide the lens for this study in analyzing the interview data regarding the implementation of the DoDEA mathematics standards.

> Change needs to be measured over years and possibly decades. Real change in attitude and behavior involves choosing the right classroom materials, making technology readily available, empowering teachers through inservice and professional development programs, receiving ongoing support, and adopting appropriate assessment programs. Anything less will limit the process [of the implementation of the innovation]. (Wertheimer, 1995, p. 87)

Summary

In providing a basis for this study, three complex yet interrelated topics are addressed through a search of pertinent literature. Literature pertaining to the standards movement and standards-based instruction provides the setting for illustrating that educating students in a "planned and systematic fashion begins with the identification of standards. . . . We use standards to help structure the blueprint for developing a system capable of excellence" (Foriska, 1998, p. 6). Standards-based reform, propelled and stimulated by NCTM, has been a hallmark in education since the 1980s (Bybee, et al., 1997).

"Despite the seemingly widespread awareness of the standards, it is also clear that teachers have not yet translated the words into practice" (Burrill, 1997, p.336). Bybee and Ferrini-Munday (1997) contend that "it is unlikely that all professionals in mathematics education will be uniformly committed to every word and idea present in the national standards" (p. 281).

Top-down mandated change and its effects on the implementation of initiatives by teachers are also addressed in the literature. "In the current struggle between state accountability and local autonomy . . . success depends on the extent to which each force can willingly contend with, if not embrace the other, as necessary for productive educational change" (Fullan, 1993, p. 40). Above all else, however, "teachers must be the cornerstone of any systemic reform directed at improving our schools . . ." (Darling-Hammond, 1994, p. 482).

> Most previous reform attempts in mathematics education are now judged to have failed primarily because researchers and curriculum developers

> failed to take into account the existing knowledge, beliefs, values and purposes of teachers . . . and of the cultures and contexts in which teachers work. (Knapp & Peterson, 1991, p. 2)

The CBAM construct and its contributions to research regarding change implementation are explored through the literature as a lens to examine the change process and why implementations succeed or fail.

> In the last couple of decades, the most predictable characteristic of education has been change – change in classroom arrangement, textbooks, teaching methods – in fact, change in every aspect of education. Although innovations have been very common, their success has been limited; large numbers of children still do not learn the basic skills, nor do they gain an appreciation of the endless range of knowledge and abilities that schools seek to develop. Many educators feel it is not the quality of the innovation that is lacking; rather, this failure is due to our lack of knowledge about and attention to the process of change and the requirement for successful change. (Loucks, et al., 1998, p. 1)

Our expectations for teachers to change must be tempered with the same understanding that we have for our students. "Just as we have concluded that students have to construct their own meaning for learning to occur, people in all local situations must also construct their own change meaning as they go about reform" (Fullan, 1999, p. 67).

The search of the literature aids to validate the notions that standards are an essential part of what and how we teach, and the degree of standards implementation in schools is directly linked to teachers' perceptions regarding the mandated change. The literature repeatedly illustrates that "change is not easy even when those involved are committed to making the effort" (Protheroe, 1990, p. 107).

Brown and Disenhardt (1998) use the analogy of a traffic light to illustrate the change process. They argue that too much structure creates a gridlock, while too little

structure creates chaos. If there are no lights, traffic is chaotic. If there are too many lights, traffic stops. A moderate number of lights creates structure, but still allows drivers to adapt their routes in surprising ways in response to changing traffic conditions.

CHAPTER III

DATA PRESENTATION

The exploration of mandated change imposed on classroom teachers was the purpose of this study. To be precise, this study examined the degree of implementation of the Department of Defense Education Activity (DoDEA) mathematics standards and the perceptions of elementary school teachers in Department of Defense Dependents Schools (DoDDS) regarding the use of the math standards. Sixteen fifth grade teachers were selected for the study from a representative sampling of teachers in DoDDS schools in Europe and the Pacific regions.

The empirical information collected from the teachers is presented in this chapter. Hall's Concerns Based Adoption Model (CBAM) was the lens through which this data collection was analyzed. The collection, presentation, and categorization of the empirical data were conducted through documented Level of Use (LoU) interviews. The interview data was used to ascertain classroom teachers' perceptions and activities in support of the implementation of DoDEA mathematics standards. Other specific purposes of this study were to analyze teachers' perceptions of the standards using the CBAM construct; report other realities that may be revealed; and assess the usefulness of the CBAM lens for theory, research, and practice. This information was cast against the literature on the

current standards movement, the literature on the implementation of change, and the conceptual framework of CBAM.

Level of Use (LoU) Interviews

Gene Hall, a CBAM theorist, trained selected DoDEA educators to participate as interviewers for a DoDEA study during the summer of 1998. As a function of the training, to ensure reliability of LoU data collection, and to acquire certification in the LoU process, all trainees were required to conduct tape recorded interviews and submit the interview data accompanied by written analyses as a follow-up to the training. Hall and his associates evaluated the tapes and analyses. Educators who demonstrated proficiency in conducting, assessing and rating LoU interviews became certified and were assigned to assist with the DoDEA research project, Systematic Linking of Instruction, Curriculum, and Evaluation (SLICE). The taped SLICE project interviews and LoU ratings by CBAM certified interviewers were used as data in this study.

Participants

The sample population of 288 teachers was originally established through a random systematic selection (Creswell, 1994) of all third, fifth, seventh, and ninth grade mathematics teachers from DoDDS schools in Europe and the Pacific regions. Each of the 288 teachers became affiliated with the SLICE project as participants in study. These teachers were interviewed and rated by LoU certified educators. The LoU ratings assigned to the participants indicated their degree of mathematics standards implementation. From the initial list of SLICE interviewees, a purposive sample (Patton, 1990) of 16 fifth grade

teachers was chosen for this study on math implementation to ensure representation of varying levels of use of the mandated standards.

To measure each individual's LoU of an innovation, focused interviews (Merton, Fiske & Kendall, 1956) were conducted. The interview instrument, created by the developers of CBAM, requires extensive training to assure that design objectives are protected. The administration of the LoU requires that a standardized set of content-specific questions be used since they have been found to be effective in eliciting the necessary information (Loucks, Newlove & Hall, 1998). However, a thorough understanding of the interview objectives is also necessary to use proper judgment in posing and sequencing questions, and in probing insufficient responses.

Although the LoU interview requires a set of prescribed questions, the LoU concept is too complex to expect that probes and follow-up questions can be completely standardized and still be appropriate for every situation. Consequently, flexibility is built into the CBAM interview process. An attribute of the LoU concept and interview process is that it is generic and not specific to any one innovation. The standardized set of LoU questions may be used in studying any innovation and implementation (Hall, et al., 1975).

To account for individual variations in use of an innovation, the LoU process analyzes eight distinct levels of implementation that an individual may demonstrate. The levels range from Level 0 through Level VI: Level 0, Non-Use of the innovation; Level I, Orientation state whereby user is acquiring information about the innovation; Level II, Preparation state where user is preparing for first use of the innovation; Level III, Mechanical use state; Level IV A, Routine use or stabilization of the innovation; Level IV B, Refinement state whereby use is varied to increase impact on students; Level V,

Integration state where user combines own efforts to use the innovation with colleagues; and Level VI, Renewal state whereby the user modifies and increases impact of the implementation (Loucks, Newlove & Hall, 1998).

Each LoU dimension describes the various behaviors of the innovation user during that particular stage of the implementation. Behaviors range from spending most efforts in orienting, to managing, to integrating the use of the innovation (1998). Because the mandated DoDDS mathematics standards were introduced several years ago, no teacher in this study was assigned a rating lower than Level III. However, it is unlikely that teachers might have reached Level VI, the Renewal state, within such a short timeframe.

The following LoU ratings were assigned to the 16 fifth grade mathematics teachers in this study by certified CBAM interviewers.

TABLE I

LEVEL OF USE (LOU) RATINGS

	0 Non-Use	I Orientation	II Preparation	III Mechanical Use	IVA Routine	IVB Refinement	V Integration	VI Renewal
Number of Teachers	0	0	0	5	5	5	1	0

Reporting

Empirical information from 16 DoDDS fifth grade mathematics teachers was collected in the form of teacher perceptions from the LoU interview comments. Using a constant comparison process (Glasser & Strauss, 1967), seven categories surfaced that were ordered according to their salient attributes to provide descriptive, inferential information that could later be compared to formulate propositions (Lincoln & Guba, 1985). Relational statements from the interviewees were categorized from the data to provide a meaningful and relevant explanation of the data (Glaser & Strauss, 1967). The seven categories created from the data are listed below:

- Reaction to Mandated Change: teacher perceptions regarding top-down mandated standards implementation, local level input, and teacher involvement in decision-making.
- Sharing of Ideas and Materials: teachers meeting, sharing and working together.
- Modifications of Standards Implementation: teacher-generated adaptations to mandated standards-based instruction.
- Effects on Students: impact of new standards implementation on students.
- Impact of Institutional Support: teacher readiness for implementation of new standards and the associated teacher expressions of certainty, adequacy and confidence regarding the support.
- Logistical Issues: time, resources, supplies, supplementary materials, and other logistical considerations.

- Miscellaneous Comments: teacher remarks regarding the standards.

Reaction to Mandated Change

Glimpses of the perceptions of 16 fifth grade teachers regarding the forced implementation of DoDEA mathematics standards were seen throughout the interview process. Participants were asked to give their opinion of the strengths and weaknesses of the standards. Impressions of a top-down mandated implementation were revealed during the interviews by some of the respondents. As a group, the interviewees elicited both positive and negative reactions to the math standards initiative. Teachers sometimes made comments about their level of satisfaction with the standards and frequently offered supporting statements of their position. There were no specific questions about the standards being "mandated" during the interviews, though some of the teachers provided a variety of remarks suggesting their displeasure with the forced implementation. Teachers did not have involvement in the decision making process regarding the new math initiative.

The comments made by teachers interviewed regarding the strengths and weaknesses of the mathematics standards pertained to a variety of issues including perceived parent and student feelings and perceptions of the standards. Many responses from the participants related directly to compliance and non-compliance behaviors to external controls.

Compliance Behavior

The 16 teachers interviewed expressed statements of varying degrees of compliance regarding the mandated math standards implementation. Many teachers

offered constructive criticism of the standards with statements like, "Generally, teachers have done a pretty good job because of what the system has gone through . . . DoDDS, which has basically copied what has come out of NCTM, has done an excellent job. I use the DoDDS expectancies," and "I think the standards are great. Especially if you have a good group [of students]." Another teacher stated, "They [standards] tell me exactly what I need to know and exactly what I need to do for the kids. I don't see any real weaknesses because they pinpoint exactly what I should be doing." Others offered such comments as, "I look at the table of contents, the difficulty of the skill and I teach according to what I have to do," and "I refer to them for clarification if I find myself in a fuzzy area. I use that to take a step back to make sure that my focus is going in the right direction. I have been really busy, but I try to read up in the NCTM on what is new. I try to keep current because it seems that a lot of our standards follow what is new."

> One teacher was overwhelmingly positive about the standards and stated,
>
> I don't think that I've ever seen, in my 26 years of teaching, anything that does it better than not just talking about math, and MathLand is a major part of that. The entire process is based on meaning, building the meaning, constructing that meaning, building those things within their minds that they can use. I think that is the overwhelming strength of this approach.

Some expressions of compliance by teachers appeared to be somewhat less than enthusiastic. This was seen in such comments as,

> The standards have been set, and we know those are the things we teach in math. We've always known what they were, it's just we got a little confused when we brought in a new program that taught those things differently,

and "If our curriculum supports the standards then most of the teachers will be doing what they are supposed to be doing." One teacher said,

> So it's a lot of things that we have to be aware of. Because it's not only math, it's all of the subjects that we have to be looking at the standards. So it's difficult once in a while. If there is a standard in here in what I'm teaching, and it might just happen, I'm supposed to teach with the standard. I know they [students] need to know other things and I have them.

Some of the teachers seemed to be confused about the relationship between curriculum standards and the mathematics curriculum as seen in the following representative response to questions about mathematics *standards*.

> I think MathLand is the biggest innovation we've had ever. I like it and heard rumors that we were going to abandon it, and I hope that it isn't true because I feel that MathLand has been uplifting of all mathematics. I just think it's wonderful.

However, despite the fact that some teacher responses to questions on standards addressed the curriculum instead of curriculum standards, the reactions of these teachers were often in support of teaching the prescribed DoDDS adopted mathematics standards. An illustration of this is seen in this sample statement, "I'm teaching MathLand and MathLand was chosen to implement the standards so I'm assuming that I'm meeting quite a few standards."

Non-Compliance Behavior

A small percentage of the teachers interviewed expressed comments about the standards that indicated behavior that might be construed as non-compliant. In some cases it appears there is no deliberate attempt to be out of compliance, though the spirit of the law might sometimes be perceived as questionable. Examples of this include statements like,

There is a quality of danger in sticking to something that's on a piece of paper and that is itemized, because you still want to be open to different teachable moments. Because if something comes up and its' not in the math standards and you were feeling tied down by the math standards, you might not explore it because you would want to get back to what you really need to do. I don't think that I use the math standards so much that I am tied down by them. I just use them as a kind of a guide, or, "A weakness [in the standards] would be the teacher's own inadequacy or rebellion against teaching this type of program - not having an awareness of where this program is going," and

> Where I know I'm not meeting the standards I try to pull some supplemental activities. But I'm not even attempting to meet all of them. There is too many and MathLand doesn't reach them all. Math isn't the only subject that I teach. But if it's my responsibility to make sure that I have everything I need to meet all the standards, well, I don't have the time to do it. There are some there, as we were looking over my grade level, that we had no idea what they mean. So if the teacher has no idea of what they mean, then it's hard to implement those.

Top-Down Control

A few of the respondents alluded to the notion of a forced implementation of the mathematics standards. Some of the comments expressed by teachers indicated resentment about the standards implementation as well as the top-down presentation of the new math initiative. The following statements are examples of dissatisfaction by teachers interviewed in the study:

> We are counting on the experts to base the curriculum on our standards. They may send us a new set of standards and say put these in your standards curriculum . . . depends on the powers that be. If they tell us we need to collaborate and increase this stuff, that's what we'll do. But at this point I think teachers have enough on their plate. And I don't think that this is a responsibility that they should have . . . Until they have another way for

> us to record their [students'] progress as far as grades go, there is nothing else we can do . . . They would have to change the report card before I could do something...depends on the powers that be. If they say put that book in front of you and make sure that you check off what you've done, I'll do it. Teachers shouldn't have to memorize them [standards] and have them in front of them. They should be able to count on the professionals who set up these curriculums to support the standards.

When asked by the interviewer, "Are you considering or planning to make major modifications or replace the standards at this time?" a teacher replied, "I'm not. That's up to the school system to do." One teacher said the standards are repetitive, and that he just tries to "keep in mind to touch all bases." The teacher further stated that he has made no attempt to do anything about the weaknesses stating,

> What can you do? I have a hard enough time keeping track of myself. Next thing you know they came out with a supplementary workbook, which I feel, is inferior. I'm just waiting for the experts to change their minds again. You just stay in the pilot and go with it, ya know.

Another teacher expressed clear dissatisfaction with the standards and the top-down implementation through the following commentary,

> I just assumed that DOD is going to give you a curriculum they say is not to drive the standards, but those people make those decisions and have been out of the classes for a long, long time. And if really they think that a teacher has time to go through all of the standards, and the ones not met by the adopted stuff...thinking we are going to go and dig up materials is unrealistic. There is not enough time. So by looking through the standards and trying to adjust a little bit this year, that's much more than I've done in the past. I'm at the bottom step looking up, feeling overwhelmed, not only because there are too many standards. And because of most of them, except for the problem solving and the communication, I've had to go elsewhere to find the information and I'm not about to do that. I have not had the time to do that. That doesn't mean that I don't want to, but it's not the teacher's responsibility to build the curriculum, that's DOD's responsibility. And it's not right to say the curriculum doesn't jive, and "you're teaching the standards" when you haven't given me time to prepare that material. And there's not time in a school day to do that, not with papers to grade, parents to call, and things like that. We are talking about

> hours and hours of work, which I know because I've done it . . . And I don't think we should have to do that. It's not our job.

One teacher offered the following insight regarding new teachers and their accommodations to the standards-based curriculum,

> Some new teachers get overwhelmed, "Here, learn these and do this, etc...thank you very much."So we really encourage them to come in as needed. I did a lot at the beginning of the year when I took a few of the new teachers and made sure that they felt that they were going in the right direction.

In support of their stated perceptions and negative reaction to the mandated mathematics standards implementation, a few of the teachers discussed parent issues and their lack of support for the new math initiative. One teacher stated,

> When I try to talk to parents about what we are doing in MathLand, they tell me they don't want to know what we are doing in MathLand, but want to know what you are doing in 'real' math. I have not run into one parent, since we've had MathLand, that is a proponent for MathLand. That says a lot. When it first started, we had such an uproar because the parents were so upset about it . . . it's not the kind of math they had and not the kind of math they want their child to have. That's why they go to math tutors.

Another teacher commented,

> I tell my parents, we have to match up the standards with what we are teaching. So I have to explain this is what we are looking at, this is where we are getting it from, and this is how we are going on because they have a hard time because we don't have a set book.

One teacher took a more positive tact regarding parent perceptions of the implementation and offered an explanation of what appeared to have happened with the new math initiative. The teacher stated,

> There was a lot of misconception about MathLand, and to parents, MathLand is the math standards. You can tell them over and over it's not, and you can show them the standards, but to them what we are doing in here (MathLand), that should be aligned with the standards. Truthfully, what we do in the classroom becomes to them the standards. And if they're

> unhappy with a particular aspect of MathLand, then they would perceive it as 'why don't they have the same high standards as when I was in school?' And so I try to defuse that situation by explaining from experience in the classroom, test scores over the past several years, and show that we do have the same high standards. We've simply re-addressed areas that have become more important than let's say, four years ago. I try to reassure them.

A few of the teachers offered comments pertaining to the mandated implementation of mathematics standards in terms of their students, and some gave an account of student perceptions. One teacher stated,

> We were told that we could only use a certain percentage of computation, and that wasn't enough for the children. They really need practice and practice and practice. MathLand just didn't provide them with the practice. Students are not very thrilled with MathLand, at least not the fifth grade students. They don't want to go through the long manipulative phase. They want to shortcut it instead of spending so much time on it–especially the higher students.

Other teachers mentioned,

> It does put some limitations, but not a whole lot on me. I use the guideline. I try to make sure we are doing things that are producing future sixth graders so that they fit into the sixth grade standards.

> Recently we got a workbook that represented the more traditional approach, and at first the kids said, "Oh is this all we are going to do?" and they seemed kind of eager. And after we did a few pages they couldn't wait . . . "When are we going to go back?" I told them that we would go back and forth and work it in together, and so I don't think that I would ever want to go back because it's non-stimulating.

One teacher noted, "Every math standard that is in there for fifth grade is not appropriate for all fifth graders. They are not developmentally ready to reach some of those."

Not all teachers maintained negative perceptions of the new mathematics standards implementation. One teacher advocate made the following statement in favor of the mandated standards for students, "I think they [standards] address, what I believe, what

my fifth graders should know, what they should be building on, so that they can go on to other grades. I think they are pretty well rounded."

Summary

Perceptions of 16 fifth grade teachers regarding the forced implementation of DoDEA mathematics standards as seen throughout the interview process are presented above. The respondents also revealed teacher viewpoints on the strengths and weaknesses of the standards and impressions of a top-down mandated implementation throughout the interviews. The interviewees elicited both positive and negative reactions to the implementation of the math standards. Teacher comments reflected fluctuations in their level of satisfaction with the standards, and some teachers provided remarks that suggested their displeasure with the forced implementation. One teacher succinctly encapsulated her perception of the mandated mathematics standards implementation with the following commentary:

> Some people might have thought that this is all I have to teach, and so they didn't look back at the standards. But we knew that they were there. So I think most didn't forget, they just had to learn how to weave those standards into the new program. We just have to learn how to do the weaving, and that's the hardest part for us. In the old style, I remember going over and over [material] for six weeks, and they still didn't learn it. But we just said that we have to go on. But I think it was the approach, and we didn't realize that because we've always taught that way.

Sharing of Ideas and Materials

The fifth grade teachers interviewed in this study discussed their perceptions on sharing ideas and materials when they meet and work with colleagues. They were asked

the following specific questions during their interview regarding collaboration with colleagues: "Do you work with others in your use of the standards? Do you meet with other teachers on a regular basis on curriculum standards? Do you ever talk with others and share information about math standards?"

The 16 respondents offered a variety of comments regarding their opportunities to meet with peers to discuss math standards. An overwhelming majority of the teachers interviewed stated that they do not regularly meet or work with other teachers in the use of the standards. A few teachers commented that they do not meet with colleagues to discuss mathematics standards. However, some teachers stated that they do "share" information with other colleagues and gave hints about how often, when, where, and some techniques they employ to share ideas and materials.

Formal and Informal Meetings

Only three of the teachers stated that they meet formally with other staff members to discuss mathematics issues and curriculum standards. The planned, formal meetings described by teachers consist of committee meetings such as routine School Improvement Leadership Team meetings, Grade Level meetings, and other Math Committee meetings. The purpose of these meetings was to address mathematics related issues "that sometimes include math standards." One teacher remarked, "We may talk about the standards that are being met for our math assessment that we do periodically, but other than that the standards don't come up in conversation." Another teacher replied that a lot of collaboration was being done "especially in the area of assessment through the school improvement team...based on the standards, no, and I'm not on the math committee." Yet

a third teacher stated, "We don't meet on a regular basis. There is a math committee, however, that does meet and there is going to be a schoolwide emphasis on vocabulary."

According to many of the respondents, periodic and informal information sharing sessions between colleagues are sometimes held in school to discuss the math curriculum and math standards. These informal meetings include discussions with peers in hallways, at lunch, in the teachers' lounge during breaks, and sometimes in classrooms. As one representative teacher noted, "We talk about the standards when it is an issue at the time. But [meet] on a routine basis, no." Another teacher mentioned that sharing does occur infrequently, though the teacher went on to state, "I haven't done a lot in the last six months, but have over the last couple of years." One teacher maintained that, "Once in a while, yes, we talk about them [standards]. We talk about if they are good or adapted for the grade level." Many of the teachers indicated that their informal meetings are conducted briefly and opportunely in small gatherings as seen in this representative statement, "We meet on a regular basis, in the hallway." One teacher noted, "We don't meet on a regular basis, mostly informal. I don't know if it's because we are all egotistical or what, but we talk about it and I think we are wrapped up in the things we like to do ourselves rather than something else."

Roadblocks to Sharing

Several of the teachers interviewed stated that they do not meet with colleagues to discuss math standards. Some of the more salient comments describing a lack of collaboration include, "Basically no because I am the only fifth grade teacher, out of three teachers, that teaches math. So I'm on my own here," and " We are always consulting, but

we don't meet due to time," and "Not [sharing] really, I keep a self-contained class," and "I don't meet with others. Last year I tried to get together with one teacher just because I didn't have a background but that fell through. Not much collaboration, we mostly work on individual plans," and "I'd like to know how other teachers are using them [standards]. I personally don't [share], not specifically about the math standards," and "I don't hang out in the teacher's lounge. If I have a problem I go to a colleague, but generally I don't have time for that sort of thing." Another representative comment was, "Unless I am at an inservice and I'm talking to other fifth grade teachers [I don't meet]. So I don't meet on a regular basis."

A few of the respondents detailed what they discuss when they do find time to engage in sharing conversations with colleagues. They also mentioned some of the various techniques they use to share information with other teachers on the staff. For example, one teacher stated,

> I work very closely with four to five fifth grade teachers and we share. I also talk with sixth grade teachers just to bounce ideas off. Or we share successes and failures at times. That's definitely been a plus that we have this connection. But we don't have regular meetings.

Another teacher stated,

> We talk at least two to three times a week on math. We visit each other's rooms. The other teacher showed me what she was doing. We share projects, organizational techniques, shared different ways we set up and how we prepare.

One teacher noted,

> With colleagues I talk about how I supplement. We've talked about which parts we think that maybe we can do without, maybe there is a part that took a whole week and we can either condense it because there is something of more importance or that particular approach took too long.

Other teachers made the following comments, "We discuss what we are doing, not that much of planning each other's. Just a feel of what they are doing," and "I talk to fellow teachers a lot on thoughts. In my team, we can hash back and forth ideas and also problems that have come up and get suggestions on how they did it." Another teacher stated that meetings to discuss math standards are held "sometimes within the grade levels, like if you are having trouble explaining a concept and what are the standards."

Advantages of Sharing

The advantages of having formal or informal meetings with peers about mathematical standards were noted by a few of the respondents. One teacher stated,

> Because I'm inexperienced, I go to them [colleagues] seeking advice. There have been occasions where they have given me some more ideas and a better picture of what it is [standards]. It gives me more of an exposure to different ideas, again, because I am new and coming up with new things.

Another teacher responded,

> They [other teachers] have given me some ideas that I use. We share methods and assist each other. I did peer conferencing and observation; mostly when we collaborate it's brainstorming…I'm a source of information. I demonstrate the games I play with the kids so the others teachers grasp the idea.

One teacher said,

> I am on the math committee at school, so as far as that, I advocate a little bit for them [standards] and I'm the team leader for this grade. And if they come to me with questions, and I don't have the answers, at least I can try and point them in the right direction or share experiences that I've had.

Yet another teacher commented,

> We have our committee meetings of course, and if we identify an area where we feel many people don't understand, then we do a schoolwide

> thing or a blurb at a faculty meeting. It's a kind of when a problem comes up, don't let it fester, go to one of the people on the list, ask someone.

One teacher stated,

> It [sharing] definitely helps me. I feel like it gives me something more to shoot for and gives me a broader sight on what I am doing. When it's time to get done, and if you aren't very sure of yourself, then sometimes with the curriculum you are still learning as you turn the page.

Another educator said, "I've heard, maybe, different ideas that have worked for them and you can incorporate them into yours." One teacher commented that the standards could also be used in terms of evaluating students.

Two of the respondents spoke particularly favorably of collaboration efforts regarding the standards. One professional stated,

> Once in a while you hear something and think why don't I do that, but no approach or anything like that. We just say, "What are you doing in science, math, etc." Those kinds of things I find beneficial. More like basically where I am, where she is . . .this project worked well . . . her approach on teaching . . . She was doing a section that I wasn't into yet so she got me thinking about it more and more.

A second educator reported,

> We are a small school, and the sixth grade teacher and I talk about that [standards] all the time. She is a super resource to talk to. She has neat ways of making sure this is covered and I think there is a great deal of communication between the fifth grade and the sixth grade. If someone comes to me and says, "I've gotten lost, I don't know which direction to go with this standard or I don't know what it means"...then I jump in at that point and relate my experiences from when that happened to me . . .

Effects of Sharing

Interviewees were asked, "Do you see any effects or what do you see as the effect of the meeting in relationship to the standards? One teacher believed that meeting with

others offered only "minimal" help. Another teacher responded, "If you are talking about do we look at the standards book the way it's listed and see if we are doing this, and talk about how we could do it better with this specific standard, no." A third teacher responded, "I wouldn't be making any changes or adjustments in your expectancies based on any coordination with other teachers." Yet, a fourth teacher commented, "The benefit is the kids. We share a little bit of stuff."

Perhaps the most noteworthy teacher response regarding the effects of sharing sessions about mathematical standards with others is the following statement.

> I think it's gone very well. I think we've seen a rise in test scores, which a lot people point to, as success. We've seen the comfort level of the faculty increase and to me that's a big thing because if they are nervous about the particular things they are supposed to teach, then that gets transmitted to the students. And no amount of prep time the weekend before can really put you at ease if you don't already have that baseline comfort with the standards and why we have them and why we think they make sense. I think the faculty comfort level is really important . . . It is interesting to see how everyone handles things and it gives me ideas that I can bring back to here, or to a specific problem, or I tell them what happened to me and what I did.

Summary

The concept of educators meeting informally or formally with colleagues to discuss and share ideas regarding DoDDS mathematics standards evoked a variety of comments from the teachers interviewed. Most of the teachers indicated they do not meet with peers on a regular or formal basis. However, it appears evident that despite the roadblocks, many of the teachers interviewed clearly perceive that discussion sessions on mathematics standards offer advantages to teachers. One teacher eloquently expressed the following benevolent viewpoint about sharing, "Sometimes [I share], not as much as I think it would

be nice to. I'm hoping that someday I might have a little more to offer. As I grow, I think that this collaboration will grow and we can build on that."

Modifications of Standards Implementation

Throughout the interview process, teachers had the opportunity to expound on their perceptions of the DoDDS mandated mathematics standards implementation. Teachers discussed the use of the standards from their perspective and contributed input on how they choose to incorporate standards in planning for their daily instruction and interaction with children in their classes. As one might expect, variations existed in the ways teachers use, modify, and make adaptations to the mandated DoDEA math standards and curriculum.

The 16 fifth grade teachers interviewed in this study were asked the question, "Have you ever considered alternatives or different ways of doing things with the standards?" A diversity of responses was stated revealing four overarching themes. Some of the teachers expressed a need to return to the basics and others asserted the necessity of obtaining supplemental resources. Another group of teachers resigned themselves to using the math standards along with the accompanying program materials provided by DoDDS, while only a few mentioned the integration of math into other subject areas.

Return to the Basics

When asked about alternative or different ways of doing things with the mandated math standards, a few of the teachers discussed the need to incorporate more basics into their mathematics curriculum. The teachers clearly perceive that the adopted standards do

not in themselves sufficiently prepare students to meet the fifth grade level math requirements. In reference to the new standards, one teacher expressed the need to modify the program after the math standards adoption. He stated, "I teach more basics now, I changed that." Another teacher asserted,

> I think most of the teachers that have been teaching for a long time have pretty much memorized the standards very well. I haven't substituted, but I have additionally added a lot of work that deals with basic mathematical calculations.

One teacher said, "I'm constantly adapting to the students' needs, they have to have the basics. I'll make changes as needed, nothing specific."

Supplementary Materials

Many of the teachers in the study discussed modifications they made in their classrooms to teach to the mathematical standards. More than half of the teachers interviewed discussed some form of supplemental materials they used in conjunction with the standards and basic math curriculum. Frequently the teachers described a void in the adopted DoDDS standards and curriculum that required their use of supplemental resources and materials to combat the perceived deficiency. When asked if alternative or different ways of doing things with the standards occur, some of the teachers responded,

> I do that every day. For instance, I bought extra books to go along with the curriculum to give the kids for more not only hands on, but visual. So I bought extra things so that they can see it on paper.

> When I see a weak area that the kids are having in whatever unit we are in, we take a little side trip from the basic MathLand curriculum to help them with any problems they are working on. I think the only modification that comes in is with the supplemental math materials.

Another teacher stated, "Sometimes we go off on tangents. When I do my math I have two books that I use, MathLand and some old math book, nothing current. You have to supplement your curriculum." Other teachers supported this feeling with their similar comments,

> We do a lot of calculations that are outside the regular MathLand work, yet they tie into it...I use the "Sixty Seconds" [computation quiz] as an addition, it came from someone and I've always taught that concept. I don't stick to the MathLand evaluation because they aren't precise. I make my own and base the quizzes on what we have done.

Some of the teachers modified their approach to teaching the standards in close alignment with the perceived needs of their students. One teacher said,

> Actually the standards are not bad; it's that the students don't have the background that's the problem. You have ideal standards, but in reality you have such a varied level of competency in students, it's impossible to say, ok I'm just going to teach fractions. You have to water it down. You have to do hands on, oral instruction. I'm too busy trying to get kids caught up. I have looked at what needs to be done and have made adjustments using manipulatives, using things that I would not have done.

Other teachers have compensated for perceived inadequacies using an assortment of materials provided to them for us with students. For example, as stated by two teachers,

> Last year, in the spring, I received a packet on "math focus week" and they had all these neat real life situations and it had wonderful ideas strictly geared toward standards that we believe in but doing them in different ways. Even just reading the packet gave me ideas to use in different units and just branched off a whole different way of thinking, and I have the MathLand [manual] and another old book that I use, plus the new books that just came, and I look at what I'm teaching and go through the three books and put a little bit from one book, and some from another book and then make up the lesson and give homework too.

Yet another teacher said,

> I try to refer to the standards at least once a week when I plan the next week's lesson to make sure what the MathLand book suggests that I use and what I use to supplement, aligns to the standards as much as possible.

One teacher commented on selected materials that from his perspective may not be appropriate by adding, "When I find something that just doesn't quite fit, I discuss it with other teachers, the principal or a math coordinator to let them know it is not meeting my need."

Use of the Adopted Mathematics Standards

Many of the teachers interviewed discussed ways they use the adopted DoDDS mathematics standards and curriculum materials provided by DoDDS. Some, but not all, of these teachers make only slight modifications and/or complement the provided program materials on occasion. This is illustrated by the following statements made by the interviewees:

> I use all of the materials, along with the math program that we have been given, and I refer to the booklet that we have been given on standards and objectives. I don't follow the daily math because they seemed so random that it seemed the students didn't understand what the 5 minutes was about and it took up the whole period…it wasn't working out. I don't really use the teachers guide that much, I pulled out activities and made them my own.

> I use them [standards] as a guide for my lessons, my content that I cover, and I haven't considered using them an alternative way since none have been shown.

Another teacher stated,

> I use them [standards]; I don't use them on a daily basis, but occasionally. I'll look through them to see, remind me of what specifically it is that the math standards are, what we are shooting for . . . It [instruction] usually relates, to some degree, to the math standards, but may not be specifically on them.

When asked the question, "What materials do you use?" a teacher responded,

> Unit cubes, blocks . . . we've used compasses and protractors. I use the overhead a lot to clarify understanding. We do graphing, and also use small groups to work on a problem. I use the MathLand book almost in sequence, I pick and choose. I use the new workbooks we have to reinforce what we have learned from the math book. I use Tune-ups. I use the manipulative all the time, every day.

Other statements made by teachers related to the use of the DoDDS adopted standards and provided materials include the following: "The workbook is nice to have and I mostly use it for homework and they only do the pages that go along with what we are doing in the class," and

> I have the book in front of me and every time that I have a chance I look at them [standards]. I should look at them every single day but you know we are really loaded with work. To be honest, I have to look deeper into all of the standards.

> I know you are supposed to look at the standards first and then evolve from that but usually I try to work on the skill that we are working and then try to draw the standard into that. I'm always open to ideas.

> The personal interviews that go along with MathLand I find very helpful to see if they have mastered specific standards, or I see that they are gaining mastery, or do I need to do something else or do it differently.

Integration of Mathematics Standards

Three of the teachers in this study referred to the integration of mathematics with other core subject material. These teachers who integrated the math curriculum were doing so in varying degrees and were at different stages in the process. One teacher explained,

> I look at the standards to see what the fifth graders need to know and doing for the year. Then I use my MathLand kit and other materials to set up my lesson. The kids have to do graphing in social studies as well as math and in language. So it is a cross curriculum kind of thing.

Another teacher stated, "I try to find activities that go with the standards and merge them and expand them." A third teacher expressed integration as a developmental process when he stated,

> I did a lot of thinking last year; what can I do to make this standard more meaningful in my classroom. I'm still toying with some of the things I came up with last year and figure out how I can bring this standard in on more of a daily basis. I used to split them up and focus on each standard, but there is no reason why I can't bring others in. You don't have to think about these one at a time . . . combining them.

Summary

Variations in the ways teachers use and modify the DoDDS adopted math standards and curriculum were seen throughout the interviews of the 16 fifth grade DoDDS teachers. Diverse alternative or different ways of instructing students with the adopted mathematics standards was discussed by teachers in the study. Teachers' perceptions of the math standards implementation comprised four overarching themes that were developed. These consisted of an expressed need to return to the basics, obtain supplemental resources, use the math standards along with the accompanying program materials provided by DoDDS, and integrate math into other subject areas.

While one representative teacher states, "The only adjustment is that I realized that I need to continue teaching the math the way I've been teaching math," others take a less conservative and more open approach,

> I have looked at the book that is given out, MathLand and looked at the directions we have from supplementing those kinds of things and I take a combination of things plus my experience, and I also received an enormous amount of training. I feel like I have taken that and implemented that in my entire math curriculum. Those kinds of things have been a steady progression that I have implemented over the years into my classroom.

Perhaps a more middle of the road approach teachers conveyed regarding the need to employ instructional modifications to the standards and curriculum is this statement by one of the respondents, "Well, if what your craft needs doesn't fit in with the standards ...but basically we cover what we are supposed to be doing. Since MathLand has come in it has been easy to adapt to [standards]."

Effects on Students

The fifth grade teachers who participated in this study were interviewed to examine their perceptions of the DoDEA math standards and to determine the degree of math standards implementation in their classrooms. The 16 classroom teachers commented on the effects of the new DoDEA mathematics standards initiative on their students. Some teachers maintained a positive position while others assumed a more negative stand regarding the impact of the math standards implementation on their students. There was also a group of educators that individually discussed both the pros and cons of the effects of the implementation on students. Teachers were asked the question, "Have you ever received any feedback from students that would affect the way you are using the math standards?" Extrapolations of the responses by teachers on the impact of the math standards and student feedback are included below.

Positive Effects on Students

Teachers in this study offered a variety of comments regarding their perceptions of the effects on students of the math standards implementation. About half of the teachers interviewed had something positive to report about the impact of math standards and the

curriculum on their students. One of the teachers stated, "It really gives the kids a chance to think mathematically about many things. They love it and enjoy it. We just received the supplemental material that has changes. And the changes are for the better of the kids." Other teachers added, "The curriculum standards that we go by to teach seem to be appropriate to grade level and appropriate to the student's ability, and good for them to be successful this year and next year," and "I do like the program. It has changed the way I teach. Kids learn how to do math."

The positive perceptions of these teachers were mirrored in comments from more of the fifth grade teachers. One stated,

> I think when you work on the standards and not just on the basic skills, it draws in a lot more thinking and it keeps me and the kids focused on that math isn't just doing things with numbers. It involves a lot of thinking, a lot of theorizing sometimes, and trying to find formulas that will make our lives easier.

Another teacher maintained,

> For me, the strengths I see in using this approach that we are doing are that the standards have a real basis in developing a meaning for the kids. You are constantly evaluating on a daily basis. Every time is different. This particular class needs a lot of the kinds of things that MathLand does with building some understanding first.

A teacher who works in a classroom with students who have a large scope of abilities said,

> I think that a strength is that the standards are broad enough that I can adjust them to meet the needs of my students. I have a full inclusion class with a range wide of students, and they [standards] aren't so rigid so that I can say these children will never be able to attain anything under this. I'm able to use the flexibility of the standards to try to meet the needs of the students in this classroom.

One respondent offered this double-sided remark, "With the standards, the kids have a halfway decent chance of learning math; there isn't just one way." Another teacher maintained, "standards are a different approach that might work better for the kids than what we were using."

Negative Effects on Students

Not all of the interviewees had favorable views of the impact of the mandated math standards on students. About half of the teachers were critical of the effect the math standards had on their students. However, criticisms were primarily centered around a lack of emphasis on computation in the curriculum. The following comments are illustrative of the concern teachers exhibited about the perceived computation deficiency. One teacher stated, "I have noticed, in the three to four years that we've been using it, that the kids are really weak in computations." Other teachers shared this sentiment by adding,

> Most kids need re-teaching on basic computation skills. You think they are getting it but they aren't getting it with one example at a time. I guess it's something that the teachers themselves have to work on. Sometimes the story problems are confusing in their wording. You don't always get to cover thoroughly the subject before handing them the sheet and asking them to do it.

> If there were the concept of just computations, they would have understood it more fully. A weakness is spending all that time on the manipulatives and number sense, and then they will lose out on computation. It is very hard to explain to parents and administrators why kids don't understand the math they knew in third and fourth grades.

Another teacher stressed an insufficiency of the standards-based curriculum in the area of measurement. The teacher stated,

> One of the problems that I have is that MathLand has dropped the metric system. And before, all of our math materials dealt with metric with only a mention of inches. And now this program is like, it's not mentioned. I still talk about cubes and metric. It's a discrepancy that we need to discuss.

A sense of frustration is heard by this teacher in the comment,

> It's difficult [for students] to move from grade level to grade level. I've skipped several chapters because they weren't ready. Their paper/pencil skills were nearly nil. There was such a shallowness of understanding, truly, in just the basic operations, that I have a lot of remedial work to do. I'm working on getting them to express verbally and in written. I am concentrating on them explaining it, not just doing it.

Student Feedback

During the interviews, the 16 fifth grade teachers were asked, "Have you ever received any feedback from students that would affect the way you are using the math standards?" Most of the feedback from the students reported by classroom teachers was very positive. Teachers' responses included such statements as, "Nothing negative. Kids seem pretty excited about MathLand" and, "Even students that aren't proficient enjoy it. They like hands on things" and, "I think they like it. No negatives." One teacher stated, "I think that when you are there doing math, especially hands on, it is overwhelmingly positive. And they like it, feel comfortable with it. It's making a difference with these children…you hear from them that they like math." Another teacher offered this endorsement saying,

> Recently we got a workbook that represented the more traditional approach. And at first the kids said, "Oh is this all we are going to do?" They seemed kind of eager, and after we did a few pages they couldn't wait asking, "When are we going to go back and do more?" I told them that we would go back and forth and work it in together, and so I don't think that I would ever want to go back because it was non-stimulating.

One of the respondents commented,

> Mostly they say whether they really liked something or really didn't like something we did. I don't think that they are as aware of the standards, but they know objectives that we do for each lesson. I ask them at the end of each objective if we met it because it's written on the board . . . "by the end of this lesson this is what we want to have accomplished, have we completed this, do we have the knowledge to restate," blah, blah, blah. And if they say no, and they will be really honest, and I say we have to do this some more. I don't think they analyze it in their minds as math standards, but they really can come at it from the objective level and say, "Yes, we know how to do that," and jump up and show whatever it is they were supposed to do.

Another teacher mentioned feedback from students comes, "Only when they say they like this . . . This is also a learning experience for me. When I get feedback, I make sure there is a balance with manipulatives and pencil and paper."

A few of the teachers received the following negative feedback from students. One teacher noted,

> Children said they did not know how to divide by two numbers. They did not learn it last year because it was not included in the math program. I'm receptive to their feedback. Sometimes we do things they don't like to do, other times we do things they like, even though they didn't need it because they had such a good time with it. I listen to my students. My prior students have told the new teacher comments with good feedback.

A couple of the respondents replied that their students had given them "no feedback," though one added, "But I was thinking of asking the students to evaluate all the subjects in general and how they would approach it or for other suggestions." Another stated, "No [feedback], but there are some of the standards that I find there that kids in my class have a hard time meeting." One-fifth grade teacher revealed that the feedback received from students is in the form of "verbals, non-verbal, and dirty looks, etc."

A few of the teachers interviewed stated that they had obtained no feedback from their students on the standards or math curriculum.

Summary

The 16 classroom teachers reported mixed reviews on the effects of the new DoDEA mathematics standards initiative on their students. There was a fairly even distribution between teachers who maintained a positive or negative stand regarding the impact of the math standards implementation on their students. A balance between positive and negative comments was evident, while some teachers believe there are both pros and cons for students.

However, the evidence seems to indicate that students generally endorse standards-based instruction according to statements made by their teachers. Students were overwhelmingly positive in their critique of the standards and mathematics program delivery in their classrooms. It appears that students like the math curriculum standards despite the fact that many of their teachers do not.

As one teacher proponent of standards summarized,

> I think it's gone very well. I think we've seen a rise in test scores, which a lot people point to as success. If they [students] don't understand it, I try to find a different approach on how to do it. I try to interject humor and go at it from a silly angle, and let them correct me, etc. I also file that away and say, "Ok, this didn't work, what can I try now?"

Impact of Institutional Support

The 16 selected participants in this study were provided the opportunity to discuss the new DoDEA mathematics standards initiative. Throughout the interview process, the

fifth grade teachers responded to a variety of questions pertaining to their degree of implementation of the mandated standards and their perceptions of standards-based instruction using the adopted math standards. Institutional support, defined here as the degree of teacher readiness for implementation of new standards and the accompanying teacher expressions of certainty, adequacy and confidence regarding the support, was an area of focus for teachers.

One of the questions asked of the teachers was, "Can you summarize for me where you see yourself right now in relation to the use of the math standards?" The response to this question by teachers reveals information about their feelings of readiness for math standards implementation along with their self-perceptions regarding their level of adequacy, comfort and confidence in using the standards.

Teacher Readiness

There appears to be a wide range from low to high in terms of the teachers' self-proclaimed levels of readiness in using the adopted math standards. There is evidence that while some teachers are still trying to successfully implement the standards into their math instruction, others have progressed to "making full use" of the standards.

At the lower end of the spectrum, one teacher stated, "I need to brush up in areas that I'm not sure of. So I can say that I'm not completely knowledgeable about each and every standard." Another teacher who had similar feelings said, "I have to ask myself what did I do wrong . . . Did I use enough manipulatives . . . did I use enough initial instruction? [I am] still trying to implement them successfully."

Three of the teachers interviewed mentioned that a smoother facilitation occurred with use of the standards over a period of time. One teacher commented, "I wasn't crazy about them at first, but the more I look at them, the better I like them. I think depending on what I do next year, I would get better organized in the way I thought about them." Another teacher confessed, "I didn't have a clue last year. I'm very comfortable with it now . . . never got the training, but I have shared things that I have learned from the program with my teammates." A third teacher stated,

> I [now] find it a lot easier for myself. At the beginning I had to plan for, like today when we used the cards. I just keep cards from the years before and cut them up and put them in a bag and put them away. So it's easier to plan with the materials now.

The issue of accommodations for new teachers to the program surfaced by two of the interviewees. In reference to the DoDDS math standards and curriculum, one of the interviewees remarked that new teachers to the system "wouldn't have a sense of where they were or where they are going." A significant comment regarding standards was made by one of the teachers in the study who is a novice teacher:

> This is my first year teaching, so any information would be very helpful. I might take a look at a unit and activity and not really be scared of what would come out of it, or what it is that I see, or what needs to be done. I've asked another teacher, "Have you done this? And what came of it and how did you incorporate it into other things?" I think it would be helpful to talk to other teachers about specifically how they are using them. I feel like I'm a beginner. I'm trying at this point to meet all of the needs that my students have in many different areas, and so with the math standards, using them as a guide of the curriculum and my teaching on an occasional basis as we begin new units.

Other teachers in the study appeared to have progressed to higher stages of development and to a greater degree of math standards usage. One teacher stated,

> I feel I'm making full use and covering the standards. The MathLand [program] allows you to do that. It gives you an opportunity to do that and it gives you the materials to do it. You can enrich the curriculum.

One teacher added,

> I really did a huge re-evaluation of my understanding of the standards last year and I interjected a lot of different things and a lot of new ways of coming at things last year. And I'm still evaluating how that is going. I don't like to make too many changes too quickly. I like to keep up with what I'm doing because I feel like I've been making a positive improvement, especially since last year. But I will probably do another self-evaluation later in the year and at the end look to see how it worked, what I did and what needs to be worked on. I'll make that my challenge for the next coming year, to keep things rolling in the positive direction.

Another teacher stated this self-appraisal on the issue:

> I feel like I've been 15 years in progress on changing and it started back in the states in a workshop that was an eye-opener. I feel like I've really been 15 years retraining myself in going in the direction of the math standards. I think I have done a lot of the workshops and encourage DOD to continue with inservices . . . instructions and how to use and put them in the classroom does help you, in my point of view.

Teacher Adequacy, Comfort, and Confidence

Participants in the study offered statements related to feelings of adequacy, comfort, and confidence in their use of the math standards during the interviews. Comments from teachers varied on a continuum from a sense of isolation to a sense of security in terms of math standards implementation. One teacher on the lower end of the continuum stated, "I feel like I'm on my own."

Some of the teachers expressed feelings of inadequacy, discomfort and a lack of confidence in their use of math standards. These teachers used descriptive phrases such as, "I don't know if this is the right thing to do," and "I'm always critical of myself...and at

the same time I can say that I don't use them enough. I'm always saying that I have to do more, have to do more because I don't do enough." Another teacher said, "I think I could probably focus more on the standards, broaden or should I say, incorporate more standards perhaps. I have to work on that."

Two of the teachers interviewed maintained a somewhat higher comfort level than others in where they were in relation to the math standards. One commented,

> I'm very secure on how I'm teaching it and what I'm teaching. And parts I'm using from MathLand and parts from supplementals. I've done this grade level for a couple of years and feel comfortable. Parts of the plan that are recommended to use I sometimes find difficult because it's not always steered towards the student's needs.

Another teacher offered this self-evaluation:

> If I rated myself on using the standards on a scale of one to five, with one being I've never looked at those before in my life, and five being I live, eat and breathe the math standards, then I'd probably put myself at a three and a half to a four. I feel that I'm on the upper end of the scale. My whole life doesn't revolve around them obviously, but I feel that I really do use them, try to reflect them in my plan, and therefore in my teaching.

One teacher provided a description of the staff comfort level at his school in the use of the standards. This teacher also furnished a rationale for maintaining a high comfort zone, stating,

> Math is my favorite. We focus on how our school is going to address that benchmark, how does this fit in with the standards and how can we disseminate this information to the faculty so they will feel comfortable with the standards, comfortable with what we are doing, and so that they know that we are the people they can come to for information. We've seen the comfort level of the faculty increase and to me that's a big thing because if they are nervous about the particular things they are supposed to teach, then that gets transmitted to the students. And no amount of prep time the weekend before can really put you at ease if you don't already have that baseline comfort with the standards and why we have them and why we think they make sense. I think the faculty comfort level is really important.

Summary

The 16 teachers interviewed in this study were asked to summarize where they are in relation to the use of the math standards. The variety of responses revealed information about their range of feelings of readiness for math standards implementation along with their self-perceptions regarding their level of adequacy, comfort and confidence in using the standards. There appeared to be some overlap among teachers' perceptions regarding their sense of readiness and their feelings of adequacy, comfort and confidence in the use of the adopted mathematics standards. There is evidence that while some teachers are still trying to successfully incorporate the standards into their math instruction, others have progressed to a higher degree in the use of the standards. Comments regarding adequacy, comfort and confidence levels of teachers varied on a continuum from a sense of isolation to a sense of security in terms of math standards implementation.

Three important points are illustrated in the comments made by these teachers: a smoother facilitation of the standards implementation occurs over a period of time, math teachers new to DoDDS need readiness training and standards orientation prior to teaching the standards, and self-reflection and evaluation by teachers regarding their level of math implementation has merit.

Logistical Issues

The 16 DoDDS teachers interviewed were asked questions related to their perceptions of the logistics of the mathematics standards initiative in their schools. Specifically, they were posed the question, "What do you see as the strengths and

weaknesses of the math standards in your situation?" Responses from the fifth grade teachers centered on a variety of issues including the logistical considerations of time, resources, supplies and supplementary materials.

Time Constraints

There was little deviation among the participants in the study in their comments related to the problem of time. An overwhelming majority of the respondents made at least one reference during their interview to the seemingly universal obstacle of time for teachers in implementing the adopted mathematics standards. The element of time seemed to be a barrier for teachers in terms of their accountability in "covering the standards" for the grade level in the expected timeframe. An illustration of this is seen in the statements of some of these teachers:

> You are working on certain things and you want a certain level of mastery and that isn't happening...there are some standards that you don't get to. I'm not saying there are that many. We just don't get to everything in a school year. If there were anywhere that I would need help, it is in what to leave out if you can't cover everything. My goal is to use them all, my goal is to achieve all expectancies but usually that is not the case due to the time factor.

Other examples of the time issue problem is reflected in the comments, "I haven't been able to get all the way through fractions and I want them to have more than the basics," and "I plan to get a little bit further this year, go all the way to the end to teach some things that we haven't done before. Like some of the things with fractions" and " . . . there are things that we aren't getting to due to time. You don't always get to cover thoroughly the subject before handing them the sheet and asking them to do it" or, "I just

take the time to meet as many of the standards as possible, going through MathLand and other math activities to meet as many as possible."

Some of the teachers discussed their long-term plans regarding the math standards. One teacher responded, "I feel that I should cover as much as I can from the ones [standards] that I have in the fifth grade if the time allows me. Depends on time." Another teacher responded to the question about long-range plans by saying, "I try and cover as much as we can. I'm too busy trying to get kids caught up." One participant noted,

> We discussed ways of meeting them but there are just too many. Same thing in all subject areas, they give you too much to try to accomplish. It's totally impossible to meet all those standards. You might be able to touch upon the standards, but it's totally impossible to try and actually meet all of them. There isn't enough time in the school year to do that.

Other teachers had similar reactions,

> I spend too much time explaining something. We've hit the major areas and I want to do as much as I can this year...It depends on the time and what we can get done. I'll plan it, but when it comes down to it, you might not be on schedule.

> I do have a curriculum outline for the year and I do keep referring to it. So far I'm not doing too badly because I do try to cover most of the things that are in the standards by the end of the year. It's difficult because you have to weave between the emphasis that MathLand has and the math standards and to be sure that you are getting standards in and then you are still trying to follow this program.

Several of the teachers made mention of the time involved in using the curriculum and materials procured by DoDDS to assist with the implementation of the standards. Some of the representative statements made by the fifth grade teachers include: "Time constraints . . . it does take time for the manipulatives. By this time you haven't covered everything so I keep on, keep on, and see if I can touch all the bases," and "I try to do

individual interviews with my students at least once every couple of weeks even though it's hard to get to everybody."

Resources and Supplies

Throughout the interview, teachers had the opportunity to discuss their thoughts and feelings about the accompanying resources and supplies provided to them to support the adopted standards and mathematics curriculum. Not all teachers were content with the instructional materials procured for them. One of the teachers stated, "If you are talking about the materials that we've been given to support the standards . . . if you are going to talk about the materials, that is a whole other topic." Other teachers voiced their concerns about the math resources with comments such as, "It's hard to go through the book. There's no time to research the book, and I have a lot to do," and "We can't always find what we need. One of our past curriculum people has made up a list of things that we could also use to match up with the curriculum, so I use that also."

Some of the teachers expressed somewhat positive viewpoints on the mathematics curriculum materials provided by DoDDS. However, this has to be tempered with the consideration that not everyone may have the required materials. According to one teacher, "The strengths are the manipulatives. They are fabulous. I've had many of the things, but all the other classrooms are better off. Organization . . . it's like a shuffled deck in using the Tune-ups." Another teacher said, "I think there are a lot of things in this book that lead from one thing to another. It has a nice foundation. I use MathLand basically as the introduction."

One of the participants in the study brought up a related technology concern. This teacher stated,

> When we got this new computer program I thought that I would have the standards at my fingertips and I could pull them up and put them into a lesson in print. But since we've gotten it, it had never worked properly. We had the computer with the old version, and now that we have the new version, nothing works right. So I've been waiting a year for them not to be on paper but on the computer.

It is possible that even with the procurement of new materials, there is no guarantee that teachers will use the materials. As one teacher held, "Newly purchased things are on order, so I'll be looking at them to see how to incorporate those. There may be some things that I won't use."

Supplemental Materials

During their interviews, teachers in the study voiced their opinions on the need to modify the curriculum to teach math standards at their grade level. They expressed the necessity for more supplemental materials to complement the DoDDS procured curriculum materials to meet the adopted mathematics standards. Supplemental materials were ordered by DoDDS to provide additional computation materials for teachers to use with students and send for homework. One teacher commented, "We did get something in the [electronic] mail about supplements, but we haven't received them. And I won't send home a page of 30 questions to do."

On the issue of supplemental materials, other teachers stated, "Most of us had to make things in the past two years, to pick up more of the basics, more supplementals,"

and "I use my own curriculum. There are things that I haven't done yet but I have ideas of what I need them to sit and do, and I make notes in my book when planning."

Two of the participants discussed ways they supplement the mathematics curriculum in their classrooms. One teacher reported,

> If MathLand covers it all right, substantially, then I'll go along with that unit. If not, then I'll bring in my supplemental materials. Computer programs, it could be different worksheets, different ideas that I've pulled from different books. I pull from other resources that I have, and I am always looking for ways to extend. I order books. I'm always on the lookout for things that will enhance or teach it a different way.

Another teacher commented on a different approach to supplementing the curriculum stating,

> I start with that [MathLand] as the point of view and build the meaning. Then I go to a more traditional, Scott Foresman series. It's one of the new series and one of the teachers sent for it. It has a lot of the NCTM standards in it and they do use those things. It gives me more of a solid basis to follow that progression. I've looked at Addison-Wesley and I find that is also appealing to me to get the best of both worlds, but there are certainly conflicts when you do that.

Summary

The 16 DoDDS teachers interviewed in this study revealed their perceptions of the logistical considerations involved in the mathematics standards initiative in their schools. Specifically, they cited time constraints, resources, supplies and supplementary materials as weaknesses in the math standards implementation. Teachers most often focused on lack of time as a major contributor to the deficiency in the math adoption initiative. The teachers also noted that materials and resources were deterrents to successful instruction with math standards. As one teacher summed it up, "You have to use the materials and be

sure you look at it to be able to teach it. You can't teach the kids the standards and not have the materials."

Another of the interviewed teachers expressed the following comment that is a good encapsulation of the perception shared by many of the teachers:

> You are constantly making stuff yourself. At this point in time, I don't know if it's because of laziness, but I want it handed to me. So it's not quite working the way I want. So I go back and do things myself. I've pulled things: more projects, cooperative learning projects, etc. Everything comes down to time now. You constantly feel swamped. But this year I have a small class so I have more time. I look at the agenda again and say, yeah, I'm going to use that...pulled things out.

Miscellaneous Comments

During their interview, some of the 16 fifth grade teachers in the study gave additional comments regarding the DoDEA math standards that are worth noting. Their significant remarks fall into no particular theme or category, and encompass enthusiasm, parent communication, the National Council of Teachers of Mathematics (NCTM), confusion, training, and suggestions.

Enthusiasm

Though no question asked how teachers feel about math as a discipline, three of the teachers in the study expressed enthusiasm about teaching mathematics. One said,

> Well, I love math, and my kids love math. We find it very stimulating and have a lot of conversations and there is always room for thinking and philosophy. I just think that we have a really good time with math.

Another teacher echoed this thought saying, "Math is my favorite subject, I really feel energized about it!"

Parent Communication

One of the interview questions that all teachers were asked was directly related to talking with others and sharing information about the mathematics standards. Some teachers mentioned that they share ideas and information with their colleagues, others commented that they do not "share" with others. However, only a few of the respondents discussed communicating with the community or parents about mathematics standards. A few of the teachers mentioned discussing student math progress in parent conferences and responding to parent issues about the mathematics curriculum as questions surfaced.

One teacher communicates with her parents through a hands-on approach. The teacher commented, "I get the parents and we have parent/student activities." Another teacher stated, "Within the last two years I had Open University with parents and gave presentations to get parents to understand." When a teacher was asked by the interviewer, "What have you done with the information that you have collected from any source, from parents, student, and assessments," the response was, "Nothing, I wonder if I'll have a job next year." Another teacher maintained, "Until we get to the level where there is understanding, MathLand will not be accepted by the community, and teachers as well."

NCTM

The DoDEA mathematics standards were developed in close alignment with the national standards produced by NCTM. Copies of the standards have been distributed to classroom teachers.

Three of the teachers in the study discussed their affiliation with NCTM. One stated, "Well, the NCTM has published a lot of things–booklets, and I find those to be excellent. I've got them right there. I used to go through them regularly and adapt from them." Another teacher said, "I have been really busy but try to read up in the NCTM on what is new. I try to keep current because it seems that a lot of our standards follow what is new." The same teacher noted that materials on NCTM are found in the library, though the information " . . . comes mainly from colleagues that have more experience than I do." Yet a third teacher added, "As a member of NCTM, I'm always getting things and am kept abreast."

Confusion

The interview questions specifically addressed issues directly related to the mandated DoDEA adopted mathematics standards. Frequently the respondents provided answers that seemed to indicate confusion existed between the mathematics standards and the curriculum, as well as curriculum materials. As a representative example, when a teacher was asked whether math standards were used in the classroom, the answer was, "Yes, I'm definitely using the math curriculum." Another teacher maintained that the standards were being taught, and to identify and teach the standards, " . . . the easiest way is to go to the MathLand TE [Teacher's Edition] and pull . . ." When a teacher was asked if the standards are used, the teacher stated, "I would follow the curriculum that they gave us to use. I don't have a standard sitting in front of me so I don't question them. I just follow the curriculum."

Other confusions about the standards appeared to exist. One teacher commented,

> I see myself in the diaper stage. I feel I could do a whole lot more. As they are written in this form, we didn't have these. We had the national standards and I don't know if they are changed much from what we have in DoDEA.

Training

Several of the teachers in the study referred to training they had received on the DoDEA mathematics standards. In at least one DoDDS school district, all teachers were given a full day of inservice education on all curricula standards. However, comments during interviews by a few of the teachers seemed to indicate a desire for more information on the mandated DoDEA math standards. One representative teacher stated,

> We are always looking for ways to extend. I order books, and am always on the lookout for things that will enhance or help me teach math a different way. I think I am right in the middle, I'm always learning. Some teachers use what they are supposed to use other teachers don't.

Suggestions

Three teachers in the study advanced their notions on what should be happening with the standards in schools through their suggestions. One teacher favored cross grade articulation and stated, "Having taught the 6th grade, I know the standards. They should give us the standards of the next grade to the grade before so that they can make sure that they [students] are up to that point." Another teacher reported,

> I will always make an effort to do that [improve]. It would be nice if you could be observed more. You get observed by an administrator, but maybe by a colleague so that you could pick that up, maybe that concept of peer coaching. You don't see yourself teaching and don't pick things up. When I get observed by my administrator, I take close note but it only happens twice a year.

A third teacher offered this statement,

> I wouldn't say that we step back to see how it is going, but I do think that we do that. Not even on purpose . . . we stockpile and keep a list of running things of "If we were to do this next year, what would we change, what would we keep the same?" So even though I don't think we meant to, I think we ended up stepping back to evaluate it. Maybe something that we can think about is trying to come up with some more ways to step back to see if this is working, and if not, what can we do to fix an area that we perceive to be a problem.

Summary

Some of the fifth grade teachers in the study offered significant comments and suggestions relating the DoDEA math standards implementation. The remarks by these teachers show diversity in their thinking and perceptions of the math initiative. The issues addressed above encompass the areas of teacher enthusiasm, parent communication, the National Council of Teachers of Mathematics (NCTM), confusion, training, and suggestions.

Finally, on the topic of teaching to the math standards, one teacher concludes,

> The tough part is when I walk through the door. But I'm glad I have the curriculum because being here on an Air Force base you are going to have other things come up like jets, etc. I have to say that although MathLand takes a lot of abuse, and I'm not all that fond of it, it really helps . . .

Empirical Information Summary

The purpose of the data collection was to examine the degree of implementation of the DoDEA mathematics standards and the perceptions of elementary school teachers regarding the use of mandated mathematics standards. Using Hall's CBAM lens,

classroom teachers' beliefs and perceptions of the new math initiative were documented through LoU interviews employed by certified CBAM interviewers.

The interview information obtained from the 16 fifth grade DoDDS mathematics teachers unveiled a continuum of teachers' perceptions of the math standards that was diverse and full of contradictions. Comments by teachers in each of the seven categories yielded strong evidence that mandated DoDEA math standards were implemented by the fifth grade teachers to varying degrees and levels of satisfaction.

Although the question of a "mandated" standards implementation was never posed during the interviews, the issue of top-down control was alluded to by a few of the teachers in this study. Examples of both compliant and non-compliant behavior toward the standards mandate were also disclosed through the interviews. Many teachers perceived sharing information and materials through informal gatherings with colleagues to be beneficial. Despite the advantages of collaborating with peers, infrequent occurrences and roadblocks were revealed.

A large variety of instructional practices were employed by classroom teachers to accommodate the standards-based adoption. Diverse modifications by fifth grade teachers included a return to the basics philosophy and the personal acquisition of supplemental materials.

About half of the teachers interviewed perceived the newly implemented DoDEA math standards to have positive effects on their students. However, comments by teachers highlighted overwhelmingly favorable student feedback on standards-based instruction.

Variations existed regarding teachers' self proclaimed readiness, confidence, adequacy, and comfort levels in using the DoDEA mathematics standards. While some

educators are at a "still trying" level of implementation, others portray themselves as "fully implementing" the standards.

A sizable majority of teachers offered compelling illustrations of time deficiencies they incurred in implementing standards-based instructional practices. Resources, supplies, and supplemental materials were perceived as inappropriate, insufficient or lacking by many of the teachers in this study.

Some indications of confusion and misconceptions are seen in the interchange of "standards" and "curriculum" in teacher commentaries. Noteworthy suggestions by teachers in this study include peer observations, cross-grade articulation and periodic program evaluations.

CHAPTER IV

ANALYSIS OF THE DATA

The empirical teacher information presented in Chapter III was analyzed through the lens of Gene Hall's Concerns Based Adoption Model (CBAM). Certified CBAM evaluators conducted interviews to collect data from each of the DoDDS teacher participants in the study. The recorded interview data transcriptions were reviewed and analyzed individually and collectively using the CBAM *Levels of Use of the Innovation* (LoU) and *Stages of Concern About the Innovation* (SoC) dimensions of Hall's CBAM construct (Hall & Hord, 1987).

The purpose of this study was to explore the implementation of mandated change by classroom teachers using the conceptual framework of CBAM. Specifically, this study examined the degree of implementation of the mandated Department of Defense Education Activity (DoDEA) mathematics standards and the perceptions of elementary teachers regarding the use of the standards. The purpose was accomplished by documenting classroom teachers' perceptions and activities in support of the implementation of DoDEA mathematics standards; analyzing these perceptions and activities through Gene Hall's CBAM lens; reporting other realities that were revealed; and assessing the usefulness of the CBAM lens for exploring this phenomenon. This

information was cast against the literature on the current standards movement, the literature on the implementation of change, and the conceptual framework of CBAM.

The explanatory case study method of inquiry (Yin, 1994) was used to gather information for this study. To determine the degree of implementation and teachers' perceptions of mandated standards, data was needed from the classroom teachers who were required to implement the math standards. This information was provided through qualitative methods of research employing the focused interview process (Merton, Fiske & Kendall, 1956).

Research was conducted through a random systematic selection (Erlandson, Harris, Skipper, & Allen, 1993) of fifth grade mathematics teachers from the Department of Defense Dependents Schools (DoDDS) in the European and Pacific regions. All teachers represented in the study are fully certified educators who work directly with students on a daily basis in a regular classroom setting.

After the initial selection, all participants were assigned an LoU rating commensurate with their degree of math standards implementation by certified CBAM evaluators. From a listing of the total fifth grade teachers included in the original group of randomly selected teachers, a purposive sample (Patton, 1990) of 16 teachers was chosen as participants in this research study. The 16 selected teachers denote varying degrees of standards implementation.

Empirical information from the 16 DoDDS fifth grade mathematics teachers was collected in the form of teacher perceptions from the LoU interview comments. Using a constant comparison process (Glassier & Strauss, 1967), seven categories emerged that were organized according to their salient characteristics to provide descriptive, inferential

information that could later be compared to formulate propositions (Lincoln & Guba, 1985). Relational statements from the interviewees were categorized from the data to provide a meaningful and relevant explanation of the data (Glaser & Strauss, 1967). The seven categories created from the data are listed below:

1. Reaction to Mandated Change: Teacher perceptions regarding top-down mandated standards implementation, local level input, and teacher involvement in decision-making.
2. Sharing of Ideas and Materials: Teachers meeting, sharing and working together.
3. Modifications of Standards Implementation: Teacher-generated adaptations to mandated standards-based instruction.
4. Effects on Students: Impact of new standards implementation on students.
5. Impact of Institutional Support: Teacher readiness for implementation of new standards and the associated teacher expressions of certainty, adequacy and confidence regarding the support.
6. Logistical Issues: Time, resources, supplies, supplementary materials, and other logistical considerations.
7. Miscellaneous Comments: Teacher remarks regarding the standards.

Chapter IV provides an analysis of the data from the interviews of the 16 fifth grade DoDDS teachers that were presented in Chapter III. A description of Hall's CBAM Levels of Use and Stages of Concern dimensions are discussed, and teacher interview data are analyzed and superimposed onto Hall's CBAM construct.

The teacher interview data are presented and analyzed in this chapter according to the Level of Use ratings for teachers (e.g., LoU III, LoU IVA, LoU IVB, and LoU V). Five teachers are represented in each LoU group, with the exception of LoU V, which consists of only one teacher representative. The solitary LoU V teacher was the only participant rated at that level of use by certified CBAM evaluators.

The fifth grade teachers with like LoU ratings are grouped for purposes of comparison. The grouping of teachers by LoU aids in establishing generalizations regarding their degree of implementation and perceptions of the mandated DoDEA mathematics standards initiative. Through the examination of the activities and perceptions of teachers by their degree of implementation (LoU), a profile emerged that illustrates a relationship to Hall's Stages of Concern. The relationship between teacher profiles and Stages of Concern is analyzed in this chapter.

Levels of Use (LoU)

Hall's CBAM construct provides a structure for examining change as it relates to implementations and those individuals who are tasked with the responsibility for making the changes. The LoU offers a method of analysis of interviews to determine the degree of mathematics standards implementation of each participant in this study. "The Levels of Use (LoU) dimension of the CBAM construct focuses on the behaviors that are or are not taking place in relation to the innovation" (Hall & Hord, 1987, p. 81).

To account for individual variations in use of an innovation, the LoU process analyzes eight distinct levels of implementation that an individual may demonstrate. The levels range from Level 0 through Level VI: Level 0, Non-Use of the innovation; Level I,

Orientation state whereby user is acquiring information about the innovation; Level II, Preparation state where user is preparing for first use of the innovation; Level III, Mechanical use state; Level IV A, Routine use or stabilization of the innovation; Level IV B, Refinement state whereby use is varied to increase impact on students; Level V, Integration state where user combines own efforts to use the innovation with colleagues; and Level VI, Renewal state whereby the user modifies and increases impact of the implementation (Loucks, Newlove & Hall, 1998). Each LoU dimension describes the various behaviors of the innovation user during that particular stage of the implementation. Behaviors range from spending most efforts in orienting, to managing, to integrating the use of the innovation (1998).

For the purposes of this study, only data regarding LoU III, LoU IVA, LoU IVB, and LoU V are presented. The mandated DoDEA mathematics standards were introduced several years ago. Consequently it was predictable that none of the fifth grade teachers represented in this study were rated below LoU III since all teachers had prior involvement with the mandated DoDEA mathematics standards. Also, none of the teachers in this study were rated as a LoU VI. It was unlikely that teachers might have reached Level VI, the Renewal state, within such a short timeframe.

CBAM General Description of LoU III: Mechanical Use

According to CBAM theorists, individuals who are identified at the Mechanical Use level are engaged in attempts to master tasks involved in the innovation with little time for reflection. The user focuses on the short-term, day-to-day use of the innovation. The user is aware of how the program should ideally work, and attempts often result in

disjointed and superficial use. Changes in the use of the innovation are made more to meet the needs of the user than the needs of the client. The user solicits information from the management about logistics, scheduling techniques, and ideas for reducing amount of time and work required. Discusses management and logistical issues related to the innovation with others. Reports that logistics, time, management, and resources are the focus of most personal efforts to use the innovation. Manages the innovation with varying degrees of efficiency and often lacks anticipation of immediate consequences (Hord, et al., 1987; Loucks, Newlove & Hall, 1998).

Analysis of LoU III Interview Data

Five of the 16 DoDDS fifth grade teachers were rated to be functioning at LoU III in the implementation of the mandated DoDEA mathematics standards. A profile of the LoU III teachers that was developed from an analysis of their interview data is presented below.

Reaction to Mandated Change

LoU III teachers expressed consternation over many aspects of the standards implementation. Teacher dissatisfaction primarily revolved around the issues of resources and supplies, insufficient time, and other logistical considerations. Teachers in this group felt "overwhelmed" and constrained by the standards as seen in this representational statement, "There is a quality danger of sticking to something that's on a piece of paper and that is itemized . . . I am feeling tied down by the math standards."

The LoU III teachers in this study periodically made references to the notion of top-down control through expressions like, " . . . but those people make those decisions and have been out of the classes for a long, long time. And if really they think that a teacher has time to go through all of the standards . . ."

A demeanor of "non-compliance" with the mandated DoDEA math expectancies was demonstrated, and some teachers in this group indicated there are too many standards. Two fifth grade teachers illustrated non-compliance toward the standards by stating, "Where I know I'm not meeting the standards I try to pull some supplemental activities. But I'm not even attempting to meet all of them," and "a weakness [of the standards] would be the teacher's own inadequacy or rebellion against teaching this . . ."

Sharing of Ideas and Materials

The five LoU III teachers in this study indicated that they seldom meet to share ideas and materials primarily because of time factors. Infrequent, informal meetings occur on occasion in hallways, the teachers' lounge, and in others' rooms where teachers "bounce ideas" off each another. Some LoU III teachers maintain that they would like to collaborate with peers on math standards to "know how other teachers are using them," to "get more ideas and a better picture of what it [standards] is," and because "it gives me something more to shoot for, and gives me a broader sight on what I am doing." Some members of the LoU III group mentioned that they consult with a colleague for assistance if they have a problem.

Modifications of Standards Implementation

The fifth grade LoU III teachers in this study reported in their interviews that they do not use DoDEA adopted mathematics standards daily or regularly. Some of the LoU III teachers indicated they view the math standards as "ideal goals." One teacher asserted, "It [instruction] usually relates, to some degree, to the math standards, but may not be specifically on them."

During their interviews, the fifth grade LoU III teachers commented on modifications they made to their math programs. Teachers discussed the need to generate adaptations to the DoDDS curriculum through the use of supplemental materials. Supplemental materials included the use of new and old math resources.

LoU III teachers expressed a need to "return to the basics" in terms of math instruction since, "students don't have the background," and because students, "have such a varied level of competence." One teacher discussed the need to "water down" the curriculum and do more oral instruction. On the issue of planning, two teachers in this group remarked that they are "overloaded with work," and "too busy trying to get kids caught up" to plan more.

Effects on Students

Teachers in LoU III commented during their interviews about the impact of the mandated DoDEA mathematics standards on students. Some teachers maintained that "there is a lot of remedial work to do," and students have a "hard time" with some of the standards. Representational statements from teachers in this group included, "It's difficult

for students to move from grade level to grade level," and "There is such a shallowness of understanding, truly, in just the basic operations . . ." One teacher admitted that he "skipped several chapters because they [students] weren't ready." However, the same teacher submitted, "we do things they like, even though they didn't need it because they had such a good time with it [sic]."

Some of the five LoU III fifth grade teachers stated that students like the math standards-based curriculum, and the feedback from students is generally favorable. One teacher commented, "even students that aren't proficient enjoy it." However, teachers also revealed that student feedback did not affect the way the standards, expectancies or curriculum were used.

Impact of Institutional Support

During their interviews, LoU III teachers gave hints about their degree of readiness for the implementation of the math standards along with their level of certainty, adequacy and confidence in using the standards. The five teachers in this group gave implications of their position at the lower end of the spectrum. Only one of the five indicated a sense of security in teaching the standards. This was tempered with expressed feelings of isolation and the statement, "I'm filling in holes."

Other LoU III teachers indicated concern about teaching the math standards. Comments ranged from, "I don't know if this is the right thing to do," and "I feel like a beginner," to "I ask myself what did I do wrong? Did I use enough manipulatives . . ." A first year teacher in the group insinuated being scared about the lack of knowledge of the standards. The demeanor of LoU III teachers' comments regarding their degree of

readiness was indicative of a need for more training and information to raise the level of institutional support.

Logistical Issues

The fifth grade LoU III teachers discussed the logistical issues of time, resources, supplies, and supplemental materials related to standards-based instruction during their CBAM interviews. All five educators ranked "time" as a common barrier to standards implementation. One representative teacher stated,

> . . . but there are just too many [standards]. Same thing in all subject areas, they give you too much to try to accomplish. It's totally impossible to meet all those standards. You might be able to touch upon the standards, but it's totally impossible to try and actually meet all of them. There isn't enough time in the school year to do that.

Another logistical issue addressed by LoU III teachers included the lack of organization of the math curriculum teacher resources and the associated instructional materials. A teacher from this group remarked, "You can't teach the kids the standards and not have the materials." However, one teacher maintained that the strengths of the standards-based DoDEA mathematics program are the manipulatives.

Miscellaneous Comments

Throughout the LoU interviews, the fifth grade teachers in this study occasionally expressed additional comments that are worth noting in regard to the DoDEA math standards. Their significant remarks fall into no particular theme or category.

One LoU III teacher discussed the importance of the participation of parents in standards-based mathematics education. Sponsoring combined student and parent

mathematics activities was mentioned as an attempt to affect increased parent involvement in school.

There appeared to be confusion regarding the relationship between curriculum standards and the mathematics program. The interview questions specifically addressed issues directly related to the mandated DoDEA mathematics standards. When an LoU III teacher was asked if math standards were used in the classroom, the response was descriptive of the math curriculum, textbook, and program with no mention of standards. Standards seem to be a somewhat elusive concept for some teachers.

CBAM General Description of LoU IVA: Routine

According to CBAM theorists, individuals who are identified at the Routine Use level have reached a stabilized, habitual use of the innovation. Little thought or preparation is given toward improving the innovation or its consequences. Few, if any, changes are being made with ongoing use. The user knows the requirements for use and how to employ the innovation with minimal stress or effort. The individual makes no special effort to acquire information about the innovation. The user plans intermediate or long-range activities with very little variation in how the innovation will be used. Planning focuses on the routine use of resources and personnel. The user reports that personal use of the innovation is going along satisfactorily with few if any problems. Once an individual reaches the routine LoU it is not uncommon to remain there for an extended period of time, making only minor adjustments in patterns of use (Hord, et al., 1987; Loucks, Newlove & Hall, 1998).

Analysis of LoU IVA Interview Data

Five of the 16 DoDDS fifth grade teachers were rated to be functioning at LoU IVA in the implementation of the mandated DoDEA mathematics standards. A profile of the LoU IVA teachers that was developed from an analysis of their interview data is presented below.

Reaction to Mandated Change

As a group, the five LoU IVA teachers exhibited many similar characteristics. In discussing the DoDEA standards implementation, some teachers expressed dissatisfaction concerning logistics and the lack of support they received in terms of curricular materials. This was illustrated in the statement, "If our curriculum supports the standards then most of the teachers will be doing what they are supposed to be doing."

LoU IVA teachers insinuated an "acceptance, but with reservations" posture of the mandated standards. They appeared to be complacent, though constrained, regarding the math standards implementation. An example of this is seen in the statement, "It does put some limitations on me . . . I use the guideline [sic]."

Teachers in this group made references to the notion of top-down control. Statements regarding the "powers that be" were used to denote feelings of pressure from above to use math standards. One teacher stated, "That depends on the powers that be. If they tell us we need to collaborate and increase this stuff, that's what we'll do. But at this point, I think teacher's have enough on their plate." LoU IVA teachers seemed to be somewhat acquiescent with a hint of passive resistance to standards-based instruction.

Sharing of Ideas and Materials

The LoU IVA teachers in this study sometimes meet to share ideas and materials on the math standards, but on an informal and non-routine basis. Teachers attend grade level and other required school meetings that are held, but reported that standards usually "don't come up in the conversation" other than at these meetings, unless there is an issue.

While two of the teachers in this group desire to work collaboratively with other teachers on math standards, three out of five of the LoU IVA teachers stated they do not collaborate with colleagues in their school. The teachers submitted there are "minimal effects" to collaboration with peers on math standards. Some of the LoU IVA teachers in this study tend to work in isolation on standards planning and activities. Though teachers in this group reported there are instances of sharing with peers, there was little evidence from interview data to support this claim.

Modifications of Standards Implementation

Some of the LoU IVA teachers in this study reported that they use the DoDEA mathematics standards as a guide. These teachers indicated that they don't use the teachers' curriculum guide and follow the daily math plan sequentially because it is "too random."

During their interviews, the fifth grade LoU IVA teachers commented on modifications they made to their math programs. Teachers discussed the need to make adaptations to the DoDDS curriculum through the use of supplemental materials. Supplemental materials included the use of old and personally procured math resources.

LoU IVA teachers expressed a need to "return to the basics" in terms of math instruction since, " kids don't transfer everything," and "if what your craft needs doesn't fit in with the standards. . . ."

One LoU IVA teacher related that no alternative ways of modifying the math program or using the standards have been considered since "none have been shown to me." Another teacher noted that modifications are sometimes necessary. The teacher announced that alternative ways of using standards occur by adding, "When I find something that just doesn't quite fit and I discuss it with other teachers, the principal or a math coordinator to let them know it is not meeting my need."

Effects on Students

During their interviews, LoU IVA teachers offered various conflicting comments about the impact of the mandated DoDEA mathematics standards on students. One teacher revealed, "The curriculum standards that we go by to teach seem to be appropriate to grade level and appropriate to the student's ability." Others maintained most kids need reteaching of basic math computation because "kids just aren't getting it."

Some of the LoU IVA teachers also offered various criticisms regarding standards about the difficulty students are having with the wording of mathematical story problems and division algorithms. However, most of the LoU IVA teachers stated that their students are learning, students like the math standards-based curriculum, and that students are excited about learning mathematics.

Impact of Institutional Support

Most of the fifth grade teachers in this group indicated that they experienced more difficulties earlier in the standards implementation, but were now making progress in terms of planning and teaching the DoDEA standards-based curriculum.

One LoU IVA teacher expressed a desire for standards training. The teacher stated that no inservice education on mathematics standards had been offered prior to teaching the standards. Others made the following revealing comments about using the standards that demonstrated low levels of institutional support: "I am always saying that I have to do more," "I didn't have a clue last year . . . ," and "I am always critical of myself."

Logistical Issues

During their CBAM interviews, the fifth grade LoU IVA teachers discussed the logistical issues of time, resources, supplies, and supplemental materials as related to standards-based instruction. All five educators ranked "time" as a common barrier to standards implementation. One representative teacher stated, " . . . there are some standards that you don't get to . . . We just don't get to everything in a school year."

Resources and materials in support of the mathematics standards were also addressed by the fifth grade teachers in this study. One LoU IVA teacher stated that more basics need to be taught, and consequently more supplemental materials are required. Another teacher stated, "We can't always find what we need . . . things that we could match up with the curriculum." However, a LoU IVA teacher mentioned that new

standards-based supplemental materials ordered by DoDEA might or might not be used by teachers in the classroom.

Miscellaneous Comments

Throughout the LoU interviews, the fifth grade teachers in this study occasionally expressed additional comments regarding the DoDEA math standards that are worth noting. Their significant remarks fall into no particular theme or category.

One LoU IVA teacher discussed the importance of the participation of parents in standards-based mathematics education. Sponsoring parent mathematics activities such as, "Open University" and giving parent presentations on mathematics were mentioned as attempts to affect increased communication and parent involvement in school.

There appeared to be confusion regarding the relationship between curriculum standards and the mathematics program. The interview questions specifically addressed issues directly related to the mandated DoDEA mathematics standards. Two LoU IVA teachers demonstrated confusion when asked if math standards were used in the classroom. Responses were descriptive of the math curriculum, textbook, and program with no mention of standards.

Two noteworthy suggestions regarding math standards-based education were proposed by LoU IVA teachers. One teacher expressed a desire for peer observation and coaching opportunities with colleagues. Another educator advocated cross grade articulation to foster collaboration with teachers at other grade levels on standards-based mathematics curriculum ideas and activities.

CBAM General Description of LoU IVB: Refinement

According to CBAM theorists, individuals who are identified at the Refinement level begin to modify the program within their immediate sphere of influence. The program variation is based on formal or informal evaluation for the benefit of clients (students), and uses knowledge of both short and long-term consequences for students in making modifications. The user knows the cognitive and affective effects of the innovation on students as well as ways to increase the impact on students. The individual solicits information that focus on changing the innovation for the benefit of students. The user assesses the use of the innovation and discusses methods of modifying its use to change student outcomes. The user develops intermediate and long-range plans that anticipate possible needed resources, steps, and events for the benefit of students. The user reports varying use of the innovation to change student outcomes. The user experiments with alternative combinations of the innovation with existing practices to maximize student involvement and optimize student outcomes (Hord, et al., 1987; Loucks, Newlove & Hall, 1998).

Analysis of LoU IVB Interview Data

Five of the 16 DoDDS fifth grade teachers were rated to be functioning at LoU IVB in the implementation of the mandated DoDEA mathematics standards. A profile of the LoU IVB teachers that was developed from an analysis of their interview data is presented below.

Reaction to Mandated Change

As a group, the five LoU IVB teachers exhibited many like characteristics. In discussing the DoDEA standards implementation, this group offered positive comments about the initiative and curricular materials. Statements representative of their endorsement include, "I think the standards are great," and "I think MathLand is the biggest innovation we've ever had. I like it and heard rumors that we were going to abandon it, and I hope that it isn't true . . ."

During their interviews, LOU IVB teachers portrayed a demeanor of "positive acceptance without reservation" of the standards. When discussing concerns, as opposed to expressing complaints about the standards, this group tended to remain student focused, diffused potential problems and approached issues in a professional and constructive manner. Some LoU IVB teachers were reflective, analytical, and introspective in their outlook on the implementation of the mathematics standards. One teacher remarked,

> We've always known what they [standards] were, it's just we got a little confused when we brought in a new program that taught those things differently. Some people might have thought that this is all I have to teach. And so you didn't look back at the standards, but we knew what they were. So I think most didn't forget, they just had to learn how to weave those standards into the new program.

Sharing of Ideas and Materials

The five fifth grade LoU IVB teachers in this study reported that they share ideas and materials regarding mathematics standards. These teachers gather together not only for regularly scheduled math committee and school related meetings, but also meet to

collaborate on a non-routine basis. Collaborative activities for the "benefit of kids" include peer observations and conferencing, demonstration lessons, informal discussions about math standards, discussion of ways to supplement the math program, and a variety of other mathematics related topics.

LoU IVB teachers indicated that they enjoy "jumping in to assist" each other, and relating mathematical experiences. They stated that they incorporate shared ideas and methods into their standards-based instruction, and are advocates for their peers. Communication of mathematics standards efforts involve "blurbs in daily bulletins," a schoolwide emphasis on math topics, and spending a "reasonable" amount of time sharing with colleagues and parents. These teachers admit to being very busy, but expressed a desire to do even more collaborating with colleagues.

Modifications of Standards Implementation

The fifth grade LoU IVB teachers in this study related in their interviews that they use the standards-based curriculum materials in sequence, and they refer to the DoDEA mathematics standards in their weekly planning. These teachers discussed a desire to use the standards on a more daily basis and have found ways to combine standards to integrate instruction.

During their interviews, the fifth grade LoU IVB teachers commented on modifications they generated to their math programs. Teachers discussed adaptations they employed to the DoDDS curriculum through the use of supplemental materials. LoU IVB teachers indicated that supplemental materials were "aligned to the standards," provided to students for homework, and used to "reinforce" skills.

LoU IVB teachers referenced real life, standards-based mathematics activities that were used with students. Teachers stated that occasionally the evolution of ideas for mathematics activities in school were developed from student input. Teachers also referred to students writing in math journals, conducting personal interviews of students, and employing teacher-made materials for students as other means to effect "student mastery."

Effects on Students

During their interviews, LoU IVB teachers offered a variety of comments about the impact of the mandated DoDEA mathematics standards on students. Two of the teachers believed that students are weak in the area of computation, while one teacher found the omission of the metric system in the standards-based mathematics curriculum to be discrepant.

Other LoU IVB teachers indicated more favorable perceptions of the standard-based instruction. One teacher stated, "It really gives the kids a chance to think mathematically about many things." Another teacher maintained,

> I think when you work on the standards and not just on the basic skills, it draws in a lot more thinking, and it keeps me and the kids focused on that math isn't just doing things with numbers [sic].

A teacher in this group favored the DoDEA purchased supplemental math workbooks, and attributed a rise in standardized test scores to the standards-based curriculum.

Some of the LoU IVB teachers stated that students love the math standards-based curriculum, and that other feedback from students is very positive. However, one teacher

said that feedback from students was in the form "verbals and dirty looks," while another teacher announced that he was thinking of requesting feedback from students.

Impact of Institutional Support

During their interviews, LoU IVB teachers revealed hints about their degree of readiness for the implementation of the math standards. They also conveyed their level of certainty, adequacy and confidence in using the standards. Three of the five fifth grade teachers in this group indicated the existence of low levels of institutional support. Comments regarding their use of the standards included, "I need to get better organized," "I need to brush up in the areas I am unsure of," "I could focus more on the standards," and "I am not completely knowledgeable about . . ." were reflective of a need for more support by these LoU IVB teachers.

One of the LoU IVB teachers noted that the comfort level in school regarding the use of the DoDEA math standards had improved dramatically over time. This was attributed to schoolwide efforts to collaborate and disseminate information. The teacher described personal ongoing attempts to self-evaluate progress with the standards implementation. This teacher stated,

> If rated on using the standards on a scale of one to five, with one being I've never looked at those before in my life, and five being I live, eat and breathe the math standards, then I'd probably put myself at a three and a half to a four. I feel that I'm on the upper end, my whole life doesn't revolve around them obviously, but I feel that I really do use them, try to reflect them in my plan, and therefore in my teaching.

Logistical Issues

The fifth grade LoU IVB teachers discussed the logistical issues of time, resources, supplies, and supplemental materials related to standards-based instruction during their LoU interviews. The majority of these educators ranked "time" as a common obstacle to standards implementation. However, the issue if insufficient time was related to student activities. An illustration of this is seen in one teacher's statement, "I try to have individual interviews with my students at least once every couple of weeks even though it's hard to get to everybody."

Some of the LoU IVB teachers mentioned using privately purchased supplemental materials and resources. As stated by one LoU IVB teacher,

> I supplement with computer programs, it could be different worksheets, different ideas that I've pulled from different books. I pull from other resources that I have. I am always looking for ways to extend. I order books. I'm always on the lookout for things that will enhance or teach it a different way.

Miscellaneous Comments

Throughout the LoU interviews, the fifth grade teachers in this study occasionally expressed additional comments regarding the DoDEA mathematics standards. Their significant remarks fall into no particular theme or category.

One LoU IVB teacher discussed the importance of the participation of parents in standards-based mathematics education. Discussions and presentations with parents on mathematics standards were noted as attempts to transgress to higher levels of

understanding on the standards, improve communication, and promote active parent involvement in school.

LoU IVB teachers indicated a love of mathematics and the teaching of it, and stated a desire for more opportunities to extend and enhance their pedagogy. One stated,

> I just love math, and my kids love math, too. We find it very stimulating and have lots of conversations, and there is always room for thinking and philosophy. I just think that we have a really good time with math.

One of the fifth grade LoU IVB teachers referenced the importance of reading NCTM literature to keep abreast of standards-based mathematics education. The point is illustrated in the statement, "I have been really busy, but try to read up in the NCTM on what is new. I try to keep current because it seems that a lot of our standards follow what is new."

CBAM General Description of LoU V: Integration

According to CBAM theorists, individuals who are identified at the Integration level have decided on their own to collaborate with others within their common sphere of influence to collectively impact student outcomes. They believe that by doing so they can provide better learning experiences for their students. LoU V is determined by two key variables: collaboration between two or more persons and changes in use of the innovation for the benefit of students. The collaboration must be regular, not casual conversation, every couple of weeks. The user solicits information and opinions to collaborate with others on the use of the innovation. The user discusses efforts to increase student impact through collaboration and sharing with others on the personal use of the innovation. The user plans specific actions to coordinate use of the innovation with others to achieve

increased impact on students. The user reports spending time and energy collaborating with others about the integration of his own use of the innovation. Collaboration with others on use of the innovation is conducted as a means of expanding the innovation's impact on clients. Changes in use of the innovation are made in coordination with others. Because most teachers tend to work as solitary craftsmen, the number of persons at LoU V is typically small (Hord, et al., 1987; Loucks, Newlove & Hall, 1998).

Analysis of LoU V Interview Data

It is an anomaly that only one of the 16 DoDDS fifth grade teachers in this study was rated by certified CBAM evaluators to be functioning at LoU V in the implementation of the mandated DoDEA mathematics standards. A profile of the LoU V teacher developed from an analysis of the interview data is presented below.

Reaction to Mandated Change

The LoU V teacher expressed an extremely positive perception of the mandated DoDEA mathematics initiative. The teacher's comment reflected a focus on students and a thorough understanding of the curriculum and standards. The LoU V teacher commented,

> I don't think that I've ever seen, in my 26 years of teaching, anything that does it better. And I'm not just talking about math [standards]. MathLand is a major part of that . . . the entire process is based on meaning, building the meaning, constructing that meaning, building those things within their minds that they can use. I think that is the overwhelming strength of this approach.

Sharing of Ideas and Materials

Collaborative efforts as stated by the LoU V teacher included continuous and regular cross-grade articulation and mathematics program coordination with colleagues. Frequent sharing sessions with peers on the mathematics standards and curriculum are conducted in an informal and non-routine manner. This "busy" teacher views other teachers as beneficial "resources" to be tapped at school. This LoU V teacher remarked that an appreciation has been developed for other approaches by colleagues to the teaching of mathematics.

Modifications of Standards Implementation

The LoU V teacher in this study stated that the DoDEA curriculum materials are used for instruction along with new supplemental materials. Supplemental resources selected by this teacher reference NCTM standards to provide "theory," and give students "more of a solid basis to follow that progression." The teacher reported,

> I looked at the directions we have from supplementing those kinds of things, and I take a combination of things plus my experience, and I also received an enormous amount of training. I feel like I have taken that and implemented that in my entire math curriculum. Those kinds of things have been a steady progression that I have implemented over the years into my classroom.

Effects on Students

During the interview, the LoU V teacher commented on the impact of the mandated DoDEA mathematics standards on students. The teacher stated, " . . . the

standards have a real basis in developing [mathematical] meaning for the kids . . . building some understanding first."

In terms of student feedback, the LoU V teacher remarked, "I think that when you are there doing math, especially hands on, it is overwhelmingly positive. And they like it; feel comfortable with it. It's making a difference with these children . . . you hear from them that they like math."

Impact of Institutional Support

The LoU V teacher gave hints about the degree of readiness for the implementation of the math standards, along with the level of certainty, adequacy and confidence in using the standards. During the interview, this teacher exuded a high degree of readiness, certainty, adequacy, and confidence in using the adopted mathematics standards. The teacher related, "I feel like I've really been 15 years retraining myself in going in the direction of the math standards. I think I have done a lot of the workshops and I encourage DoDDS to continue with inservices."

Logistical Issues

During the CBAM interview, the fifth grade LoU V teacher was given the opportunity to discuss the logistical issues of time, resources, supplies, and supplemental materials related to standards-based instruction. The teacher maintained a positive demeanor about the logistical considerations supporting the DoDEA mathematics standards initiative. The teacher uses the adopted standards and materials, though supplemental materials aligned with the NCTM standards are also employed.

The LoU V teacher stated, "I think there are a lot of things in this book that lead from one thing to another. It has a nice foundation on that." However, the teacher continued, "You are constantly making stuff yourself . . . I've pulled things: more projects, cooperative learning projects, etc. Everything comes down to time now. You constantly feel swamped. But this year I have a small class so I have more time."

Miscellaneous Comments

Occasionally during the LoU interviews, fifth grade teachers in this study expressed additional comments regarding the DoDEA mathematics standards. Their significant remarks fall into no particular theme or category.

The LoU V teacher discussed the importance of training and growth opportunities for teachers through their participation at workshops and inservices on standards-based mathematics education.

The fifth grade LoU V teacher also referenced the importance of reading NCTM literature to keep abreast of standards-based mathematics education. The point is illustrated in the statement, "The NCTM has published a lot of things, booklets. I find those to be excellent, and I've got them right there. I used to go through them regularly and adapt from them."

Summary of Analysis of LoU Interview Data

An analysis of the empirical interview data from 16 fifth grade DoDDS mathematics teachers in this study was presented above. The analysis of the teacher

interview data was stratified into seven themes or categories. The categories were created from the salient characteristics that emerged from the data collection and included:

1. Reaction to Mandated Change;
2. Sharing of Ideas and Materials;
3. Modifications of Standards Implementation;
4. Effects on Students;
5. Impact of Institutional Support;
6. Logistical Issues; and
7. Miscellaneous Comments.

The data by categories were analyzed, organized, and presented according to the Level of Use (LoU) ratings for teachers (e.g. LoU III, LoU IVA, LoU IVB, and LoU V). Five teachers were represented in each of the LoU groups, with the exception of LoU V, which consisted of only one teacher representative. The fifth grade teachers with identical LoU ratings were grouped for purposes of comparison. The grouping of teachers by LoU aided in establishing generalizations regarding their degree of implementation and their perceptions of the mandated DoDEA mathematics standards initiative.

The data analysis of the seven categories revealed interesting information about the fifth grade DoDDS mathematics teachers at each LoU. On occasion, parallels and consistencies emerged in examining progressions among LoU groups across each category. In particular, when closely analyzing the combined data from LoU III and LoU IVA, in comparison to LoU IVB and LoU V, a dramatic distinction appeared. Frequently shades of comparisons and contrasts evolved on either side of the demarcation.

Teachers in LoU III and IVA expressed a presence of top-down control and were largely concerned about logistical considerations. While some LoU III teachers showed evidence of non-compliance, LoU IVA teachers exhibited a sense of constrained complacency.

The posture of teachers in groups LoU IVB and LoU V was vastly different from the other groups. These teachers demonstrated a positive acceptance of the mandated standards and were student-focused in their orientation. Their outlook toward standards-based instruction was reflective, analytical, and introspective.

All four LoU groups underscored the fact that informal and non-routine meetings with colleagues are most prevalent. Meetings consisted of grade level and math committees along with hallway and teachers' lounge gatherings. However, more frequent communication on the topic of mathematics standards, and higher sophistication levels of peer sharing occurred at LoU IVB and LoU V. Teachers at LoU IVB and LoU V were also child-centered in their comments on sharing.

The teachers in all four LoU groups indicated a use of supplemental materials for instruction. Teachers at LoU III and LoU IVA supplemented their programs with "old and new" materials, while LoU IVB and LoU V teachers used newer supplemental materials and resources that are closely aligned with NCTM standards to integrate instruction. LoU III and LoU IVA teachers expressed a need for a "return to the basics" philosophy and approach to instruction.

LoU III and IVA teachers viewed standards as "ideal goals." They admitted they do not use the standards on a daily or regular basis, and instruction is not specific to the

standards. LoU IVB and LoU V teachers use the standards in sequence and allow knowledge, experience, student input, and professional judgment to dictate pedagogy.

The impact of standards-based mathematics instruction was commented on by the fifth grade teachers in this study. More than half of all of the respondents maintained that students needed more basic computation work than was provided in the curriculum materials.

LoU IVB and LoU V teachers noted benefits to students that included a rise in standardized achievement test scores and the development of a real basis for mathematical meaning through standards-based instruction. Nearly 100 percent of the teachers remarked to the interviewers that feedback from students was positive. Student feedback ranged from "favorable" to "overwhelmingly positive."

The degree of readiness for the implementation of mathematics standards includes a sense of certainty, adequacy, and confidence. Teachers in LoU III, IVA, and IVB conveyed low degrees of these traits in their interview comments. LoU IVA teachers stated that they had experienced many difficulties with math standards earlier, but they were now making good progress in terms of instructional planning. However, two teachers in LoU IVB and the LoU V teacher exhibited a high degree of readiness for standards implementation.

Logistical considerations, such as time, resources, supplies, and materials were discussed by the fifth grade teachers. The overwhelming majority of respondents highlighted the fact that insufficient time is a common obstacle to standards-based instruction for these teachers. However, while LoU III and IVA teachers referred to

insufficient time for planning and preparation, LoU IVB and LoU V teachers associated insufficient time to be problematic with student activities and assessments.

LoU III and LoU IVA teachers indicated that materials and the curriculum also pose problems that result in a need for supplemental materials to teach the basics. LoU IVB and LoU V teachers also noted a need for supplemental materials, but for the purpose of extending and enhancing standards-based instruction.

Fifth grade teachers in this study expressed additional comments regarding the DoDEA mathematics standards. LoU III, IVA, and IVB teachers discussed efforts to enhance school-home communication and to involve parents as active participants in mathematics education in schools. LoU IVA teachers related the need for peer observations and cross–grade articulation on mathematics standards and instruction.

There appeared to be confusion regarding the relationship between curriculum standards and the mathematics program for some LoU III and LoU IVA teachers. Responses to questions on standards were descriptive of the math curriculum, textbook, and program with no mention of standards.

Teachers in LoU IVB and LoU V posited that more opportunities for teacher growth and development through workshops, inservices, and current NCTM literature are needed to enhance and extend standards-based pedagogy.

Stages of Concern (SoC) about the Innovation

There is a set of developmental stages teachers move through as they become increasingly sophisticated and skilled in using new programs and procedures (Hall & Hord, 1987). The SoC dimension of CBAM focuses on "the feelings, thoughts and

information needs of the innovation user" (Loucks, et al., 1998, p. 1). It addresses the notion that teachers located in the "I" centered stages are not able to concentrate their efforts on students' needs through innovation modification (1998). When individuals are introduced to an innovation, they are preoccupied with wondering what it will require of them and how their roles will change. "As these concerns are resolved, more task-oriented concerns emerge. Questions about what materials are needed daily and how to schedule time more effectively are typical" (p. 1). In the later stages, concerns focus on how the innovation affects students (client-centered), how to collaborate efforts, or even how to enhance student learning by replacing the innovation (Hall, et al., 1998).

CBAM research describes seven progressive Stages of Concern. The Stages of Concern are listed in three categories or dimensions and consist of the following (Hord, et al., 1987):

Self Concerns

0. Awareness: Little concern about or involvement with the innovation is indicated.
1. Informational: A general awareness of the innovation and interest in learning more detail about it is indicated. The individual seems to be unworried about self in relation to the innovation. The individual is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.
2. Personal: The individual is uncertain about the demands of the innovation, his/her level of adequacy in meeting those demands, and his/her role with

the innovation. This includes analysis of one's role in relation to the reward structure of the organization, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.

Task-Oriented Concerns

3. Management: Attention is focused on the processes and tasks of using the innovation and the best use of the information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are of primary importance.

Impact Oriented Concerns

4. Consequence: Attention focuses on the impact of the innovation on students in one's immediate sphere of influence. The focus is on the relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.
5. Collaboration: The emphasis is on coordination and cooperation with others regarding use of the innovation.
6. Refocusing: The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. The individual has definite ideas about the existing innovation or proposed alternatives.

"While the seven Stages of Concern are distinctive, they are not mutually exclusive. An individual is likely to have some degree of concern at all stages at any given time . . ." (Hord, et al., 1987, p. 30).

The first stage, Awareness, characterizes a person who has little, if any, knowledge about the new innovation. The remaining six stages are represented in three general categories or dimensions of concerns:

- Self–Concerns (stages 1 and 2) are reflective of teachers who are asking, What is this new change and how will it affect me?
- Task-Oriented Concerns (stage 3) are representative of teacher queries such as, How do I implement this change? What do I need to do to make this change happen with my students?
- Impact-Oriented Concerns (stages 4-6) include teachers who are asking, How are my students learning? Are they learning more and are they learning better? How do I work with others who are also implementing these new ideas? (Gann, 1993, p. 289)

Stages of Concern appears to be a developmental process since earlier concerns must first be resolved or lowered in intensity before one moves on to another level. Research suggests that this developmental pattern is applicable for most process and product innovations (Hall, et al., 1998). It is also significant that the advancement of teachers to higher levels of concern is not simply engineered by an outside force. The individual owns the stage of concern and therefore, the change comes from within.

> There is no guarantee that arousal of higher stage concerns will follow the reduction of lower stage concerns. . . . Whether and with what speed

> higher level concerns develop will depend on the person as well as the innovation and the environmental context. (p.6)

Comparative Analysis of Interview Data

Categories and Stages of Concern

Through an examination of the activities and perceptions of teachers, a profile of the LoU III, LoU IVA, LoU IVB, and LoU V teachers emerged. The teacher profiles were developed from an analysis of the interview data. The data were organized, analyzed, and presented in seven categories created from the salient characteristics that surfaced during the interviews. These seven categories approximate the stages in Hall's Stages of Concern (SoC) construct. In order to employ the SoC to examine the perceptions of the 16 fifth grade teachers, it is first necessary to compare the SoC stages to the categories generated from the interview data.

A comparison of the SoC and the seven categories generated from the interview data are seen in Table II.

Table II illustrates parallels that can be seen between Hall's SoC and the categories generated from the analysis of the teacher interview data. The left side of the chart highlights the seven SoC stages grouped in clusters by bands of concern (e.g. Self Concerns, Task-Oriented Concerns, and Impact-Oriented Concerns). These three dimensions of the SoC are useful in examining the developmental nature of teacher concerns and the impact of these concerns on change and new implementations.

TABLE II

STAGES OF CONCERN COMPARED TO CATEGORIES GENERATED BY INTERVIEW DATA

Stages of Concern (SoC)	Categories Generated by Interview Data Analysis
Self Concerns	
Awareness	*
Informational	*
Personal	Reaction to Mandated Change Miscellaneous Comments Impact on Institutional Support
Task-Oriented Concerns	
Management	Logistics Modifications Sharing of Ideas and Materials
Impact-Oriented Concerns	
Consequence	Effects on Students Modifications
Collaboration	Sharing of Ideas and Materials
Refocusing	*

Note: * indicates that no categories were generated by the interview data.

In comparing and contrasting the categories generated from data (on the right side of the chart) with the SoC, information is revealed regarding the variation in the degree of mathematics standards implementation among teachers. Categories including Reaction to Mandated Change, Impact on Institutional Support and Miscellaneous Comments lie within the Personal Concerns dimension of the SoC, while Logistics, Modifications of

Standards Implementation, and Sharing of Ideas and Materials fall primarily into the Task-oriented Concerns dimension.

Essentially, six of the seven categories generated from the data correspond directly with two of Hall's SoC dimensions, Self Concerns and Task-Oriented Concerns. These dimensions relate more to personal (I-centered) orientation and management issues as opposed to student orientation (client or student-centered). Consequently, teachers with profiles in these domains are largely preoccupied with Personal and Management stage issues and concerns, and are thwarted from transcending to the higher stages of concern such as Consequence, Collaboration, and Refocusing. Thus, teachers who reside in the Self Concerns and Task-Oriented Concerns stages are less likely to fully implement the innovation. This helps to explain the variation in the degree of implementation of the DoDEA mathematics standards by fifth grade teachers in this study.

However, teachers who have surpassed the Self Concerns and Task-Oriented Concerns dimensions of the SoC are more able to focus their attention and energy on students, actions, activities and behaviors that are associated with a higher degree of mathematics implementation. This helps to explain why fifth grade teachers with profiles residing in the Impact-Oriented Concerns stage exhibit a higher degree of implementation of the DoDEA mathematics standards than teachers who reside within the lower dimensions (Self Concerns and Task-Oriented Concerns) and stages.

In the analysis of the teacher interview data, it was significant to note that most of the categories of issues and concerns expressed by teachers related closely to the Self and Task-Oriented Concerns on the SoC. However, it was predictable that some of the teachers would transcend the "I"- centered stages and evolve into the "client"- centered

dimension. Typically, as teachers become more experienced and skilled with an innovation, concerns change and teachers tend to move away from "I"- centered behavior into "client"- centered behaviors (Hall & Hord, 1987).

The categories of Modifications and Sharing of Ideas and Materials overlap into two dimensions of the SoC. This is due to the fact that variations were seen in the types of modifications teachers made in implementing the standards. Most teacher modifications consisted of "I"-centered behaviors, issues and concerns.

The category of Sharing Ideas and Materials was also fractured. Some teacher comments in this category were primarily "I"-centered in orientation, as opposed to other student-centered orientation comments.

Since the mandated DoDEA mathematics standards have been in effect for several years, it is predictable that no teachers in this study were placed at the Awareness or Informational stages of the SoC. It is also understandable that no teachers would have progressed to the Refocusing SoC stage since the possibility of major changes or replacement with a more powerful alternative to standards-based instruction generally would not occur in such a short timeframe (Hall & Hord, 1987).

Integration of the LoU and SoC

The comparative analysis of the categories derived from the interview data and the Stages of Concern highlighted the parallels between them. This also aided in examining the developmental nature of teacher concerns and the impact of these concerns on change and new innovations.

When superimposed with the analysis of the Levels of Use (LoU), the Stages of Concern (SoC) yield additional insights. Integrating the SoC with the LoU provides further information regarding the variation in the perceptions of DoDDS teachers and their degree of mathematics standards implementation.

Table III illustrates the relationship among the SoC, the categories generated by the analysis of the interview data, and the LoU. As is seen in the illustration, the 16 DoDDS fifth grade teachers of mathematics splintered into two camps. LoU III and LoU IVA teachers maintained similar perceptions, and consequently, patterns and progressions emerged in examining these LoU groups across the SoC stages and dimensions. A like pattern occurred with teachers in LoU IVB and LoU V. The demarcation separating the SoC and the data analyses referred to earlier emerged again when the relationship among the SoC, the interview data categories, and the LoU were examined.

The integration of the categories of interview data, the SoC, and LoU highlights and explains the similarity in the profiles of LoU III and LoU IVA teachers, as well as the differentiation of these teachers to the LoU IVB and LoU V teachers. LoU III and LoU IVA teachers resided in the SoC dimensions of Self Concerns and Task-Oriented Concerns. Their implementation concerns revolved around personal and management issues such as logistics, day-to-day operations, short-term activities, and a return to the basics.

However, teachers in LoU IVB and LoU V were less hampered with Management and Task-Oriented Concerns and were therefore able to concentrate more on Impact-Oriented activities such as self-renewal and professional growth. An example of this is the

tendency of LoU IVB and LoU V teachers to keep abreast of current literature and developments regarding NCTM standards.

TABLE III

RELATIONSHIP AMONG STAGES OF CONCERN, CATEGORIES FROM INTERVIEW DATA, AND LEVELS OF USE

Stages of Concern (SoC)	Categories Generated by Interview Data Analysis	LoU III	LoU IVA	LoU IVB	LoU V
Self-Concerns					
Awareness	*				
Informational	*				
Personal	Reaction to Mandated Change	X	X		
	Miscellaneous Comments	X	X		
	Impact on Institutional Support	X	X		
Task-Oriented Concerns					
Management	Logistics	X	X		
	Modifications	X	X		
	Sharing of Ideas and Materials	X	X		
Impact-Oriented Concerns					
Consequence	Effects on Students			X	X
	Modifications			X	X
Collaboration	Sharing of Ideas and Materials			X	X
Refocusing	*				

Note: * indicates that no categories were generated by the interview data.

Integrating the SoC with the LoU helped to analyze and explain why a variance exists in the degree of implementation of the DoDEA mathematics standards by the fifth grade teachers in this study. The comparative process also demonstrated the powerful influence teacher perceptions have on the success and impact of new innovations.

Summary

Chapter IV provided an analysis of the interview data of the 16 fifth grade DoDDS teachers. The data were stratified into seven themes or categories created from the salient characteristics that emerged from the data collection. The categories included: Reaction to Mandated Change, Sharing of Ideas and Materials, Modifications of Standards Implementation, Effects on Students, Impact of Institutional Support, Logistical Issues, and Miscellaneous Comments.

A synopsis of Hall's CBAM *Levels of Use* and *Stages of Concern* dimensions was discussed, and teacher interview data were analyzed and superimposed onto Hall's CBAM construct. Parallels and consistencies emerged in examining data among LoU groups across categories and SoC dimensions. However, a distinct demarcation line emerged between the LoU III and LoU IVA teachers when compared and contrasted with the LoU IVB and LoU V teachers. Teachers in LoU III and IVA expressed a presence of top-down control and were largely concerned about logistical considerations.

While some LoU III teachers showed evidence of non-compliance, LoU IVA teachers exhibited a sense of constrained complacency. The DoDEA mandated mathematical standards were implemented at a Mechanical or Routine level, and teacher interview comments frequently related to an "I"-centered orientation.

The posture of LoU IVB and LoU V teachers was vastly different from the other groups. These teachers demonstrated a positive acceptance of the mandated standards and were student focused in their orientation. Their outlook toward standards-based instruction was reflective, analytical, and introspective. LOU IVB and LoU V teachers implemented the DoDEA mandated mathematics standards at a level of Refinement and Integration. Also, LoU IVB and LoU V teachers communicated more frequently on the topic of standards, and collaboration occurred at higher levels of sophistication.

More than half of all of the respondents commented that fifth grade students needed more basic computation work than was provided through the curriculum materials.

Nearly 100 percent of the teachers indicated that feedback from students on standards-based instruction was positive. The overwhelming majority of all respondents highlighted the fact that insufficient time was a common obstacle to standards-based instruction for these teachers.

There appeared to be confusion regarding the relationship between curriculum standards and the mathematics program for some LoU III and LoU IVA teachers.

Through the examination and analysis of the activities and perceptions of teachers by their degree of implementation (LoU), a profile emerged that illustrated a relationship to Hall's Stages of Concern (SoC). The relationship between teacher profiles and Stages of Concern was analyzed.

The seven progressive Stages of Concern were listed and described in three categories. They include: Self Concerns – Awareness, Informational, and Personal; Task-Oriented Concerns – Management; and Impact-Oriented Concerns – Consequence, Collaboration, and Refocusing. Six of the seven categories generated from the data

correspond directly with two of the SoC dimensions, Self Concerns and Task-Oriented Concerns that relate more to personal (I-centered) orientation, as opposed to student orientation (client-centered).

The relationship among the SoC, the categories generated by the analysis of the interview data, and the LoU was examined. The 16 DoDDS fifth grade teachers of mathematics splintered into two camps. Collectively, the LoU III and LoU IVA teachers maintained similar perceptions, and consequently, patterns and progressions emerged across the SoC stages and dimensions. A like pattern occurred with teachers in LoU IVB and LoU V.

The integration of the categories of data, the SoC, and the LoU explained the similarity of the profiles of LoU III and LoU IVA teachers, as well as the differentiation of those teachers to the LoU IVB and LoU V teachers. LoU III and LoU IVA teachers resided in the SoC dimensions of Self Concerns and Task-Oriented Concerns. Their implementation concerns revolved around personal and management issues such as logistics, day-to-day operations, short-term activities, and a return to the basics. Teachers in LoU IVB and LoU V were less hampered with Management and Task-Oriented Concerns, and were therefore able to concentrate more on Impact-Oriented activities such as self-renewal and professional growth.

Integrating the SoC with the LoU helped to analyze and explain why a variance exists in the degree of implementation of the DoDEA mathematics standards by the fifth grade teachers in this study. The comparative process also demonstrated the powerful influence teacher perceptions have on the success and impact of new innovations.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, IMPLICATIONS AND COMMENTARY

"Sustaining any profound change process requires a fundamental shift in thinking." (Senge, 1999, p. 10)

Summary of the Study

The implementation of mathematics standards by fifth grade classroom teachers in Department of Defense Dependents Schools (DoDDS) was the focus of this study. Though classroom teachers are typically not involved in decisions regarding the adoption of mandated initiatives, they are, however, responsible for the implementation. The data collection, presentation, and analysis of change implementation in this research study explained the association between teacher perceptions and behaviors and the variance in the degree of implementation of the mathematics standards initiative.

Purpose

This research study was designed to explore the implementation of mandated change by classroom teachers. Gene Hall's Concerns Based Adoption Model (Hall & Hord, 1987) was the lens used in conducting the study. In particular, this study examined

the degree of implementation of the DoDEA mathematics standards and the perceptions and behaviors of fifth grade teachers in Department of Defense Dependents Schools (DoDDS) regarding the use of the standards. The purpose of the study was accomplished through the following:

- The degree of implementation of the DoDEA mathematics standards and the perceptions and activities in support of the innovation by fifth grade classroom teachers were ascertained;
- An analysis of the perceptions and behaviors of fifth grade teachers was conducted through the lens of Gene Hall's Concerns Based Adoption Model (CBAM);
- Other realities were revealed and reported; and
- Given this research, the usefulness of the CBAM lens for exploring this phenomenon was assessed.

Data Needs

To accomplish the purposes of this study, empirical data were needed regarding the degree of mathematics standards implementation for each of the participants. Descriptive information was also needed concerning teacher perceptions of the mandated mathematics standards and the associated teacher activities and behaviors.

Data Sources

Empirical information was collected from 16 fifth grade teachers of mathematics in Department of Defense Dependents Schools in the European and Pacific regions. All

teachers represented in the study are fully certified educators who work directly with students on a daily basis in a regular classroom setting.

The Department of Defense schools number approximately 150 in 11 districts including the United Kingdom, Italy, Belgium, Germany (four districts), Korea, Japan, and Okinawa. They also include the Turkey District, which extends to Spain, the Azores, and Bahrain. There are a combined total of 74,000 students, 6,000 teachers, and 400 administrators in these districts. The Department of Defense Dependent School System is one of the 10 largest and most geographically dispersed American school districts.

Data Collection

The explanatory case study method of inquiry (Yin, 1994) was used to gather information for this study. To determine the degree of implementation and teachers' perceptions of mandated standards, data was needed from the classroom teachers who were required to implement the math standards. This information was provided through qualitative methods of research.

To obtain the required data from the 16 teachers in this study, two components of the CBAM construct, the Levels of Use of an Innovation (LoU) and Stages of Concern About an Innovation (SoC) were employed. Research on the topic of change implementation was conducted after a random systematic selection (Erlandson, Harris, Skipper, & Allen, 1993; Creswell, 1994) of DoDDS fifth grade mathematics teachers in the European and Pacific regions.

Certified CBAM evaluators conducted focused interviews (Merton, Fiske & Kendall, 1956) using the CBAM LoU interview process with all participants in the study

at their overseas work site. The standardized LoU interview questions were constructed to provide information regarding the degree of implementation and the perceptions of teachers, as well as their associated activities and behaviors, in support of the DoDEA mandated fifth grade mathematics standards. CBAM evaluators assigned interviewees an LoU rating commensurate with their degree of implementation of the standards. From the list of randomly selected teachers, a purposive sample (Patton, 1990; Erlandson et al., 1993) of 16 teachers, representative of varying degrees of standards implementation, was chosen for this study. The recorded interviews were transcribed verbatim to provide an accurate analysis of the data.

The Stages of Concern (SoC) component of CBAM research focused on the "feelings, thoughts and information needs of the innovation user" (Loucks, et al., 1998, p. 1). The SoC was employed in this study to examine the perceptions of the 16 fifth grade teachers regarding the mandated DoDEA mathematics standards implementation. A comparative analysis of the SoC, the categories generated by the analysis of the interview data, and the LoU was conducted to examine the relationship.

The seven progressive stages in the SoC were listed and described in three categories or dimensions. They include: Self Concerns – Awareness, Informational, and Personal; Task-Oriented Concerns – Management; and Impact-Oriented Concerns – Consequence, Collaboration, and Refocusing.

Data Interpretation and Presentation

Preceding the data collection, an expansive review of the literature was conducted on the standards movement, the implementation of mandated change, and Hall's CBAM

theoretical construct. Empirical information from the LoU interviews was continuously cast against the literature. Information obtained from teacher interviews was transcribed and organized for analysis. Responses from the teacher interviews were formulated and sorted into categories to allow for data analysis and presentation. A complete disclosure of responses was made and summary representations in the form of charts assist in data analysis and presentation.

Data Analysis

The empirical information obtained from teacher interviews was analyzed individually and collectively. The interview data was analyzed individually by certified CBAM evaluators to determine the degree of implementation of the mathematics standards for each fifth grade teacher in the study. Through a process of constant comparison (Glaser & Strauss, 1967), the interview data was collectively sorted, organized, analyzed, and presented in categories created from the salient characteristics that surfaced during the interviews. Seven relevant themes or categories of relational statements that reflected the perceptions and activities of the 16 teachers emerged from the data. These categories allowed data to be organized into profiles to furnish information that could be compared to formulate propositions (Lincoln & Guba, 1985). Each profile was a compilation of the perceptions and behaviors of the participants in relation to the category. The data allowed for a rich, thick description (Erlandson, et al., 1993) of teacher perceptions and activities concerning standards-based instruction in mathematics. The seven emergent categories from the interview data included: Reaction to Mandated

Change, Sharing Ideas and Materials, Modifications of Standards Implementation, Effects on Students, Institutional Support, Logistical Issues, and Miscellaneous Comments.

To make sense of the research data, Hall's CBAM lens was applied through the use of the LoU and the SoC dimensions. The seven categories, generated from the analysis of the teacher interview data, were compared and contrasted with the seven SoC stages to reveal parallels and relationships regarding the variation in the degree of mathematics standards implementation among teachers. The categories generated from the interview data and the SoC stages were integrated with the LoU profiles. The intersection of the three sets of data aided in examining the developmental nature of teacher concerns and the impact of these concerns on change and new implementations.

My background and experience in the field of education influenced the collection and analysis of research data. To counteract any personal biases, the empirical information was viewed through a theoretical framework, and corrections and revisions were made periodically. Discussions were held frequently with a colleague to guard against biases in data presentation and interpretation.

Summary of Findings

Findings from this study are vast and significant. The purpose of the study was to explore the implementation of mandated change by classroom teachers. In particular, this study examined the degree of implementation of the DoDEA mathematics standards and the perceptions and behaviors of Department of Defense Dependents Schools (DoDDS) fifth grade teachers regarding the use of the standards. Gene Hall's Concerns Based Adoption Model (Hall & Hord, 1987) was the lens used in conducting the study.

Study findings are presented in the format of a four part brief that includes a summary of interview data, LoU findings, SoC findings, and a summary of the integration of the LoU and the SoC.

Summary of Interview Data

Through a process of constant comparison (Glaser & Strauss, 1967), the interview data was collectively sorted, organized, analyzed, and presented in categories created from the salient characteristics that surfaced during the interviews. Seven significant categories of relational statements regarding the implementation of the mandated DoDEA mathematics standards teachers emerged from the data. The categories reflected the perceptions, major concerns, issues, and activities of the 16 teachers. The categories were meaningful since they allowed data to be organized into profiles to furnish information that could be compared to formulate propositions (Lincoln & Guba, 1985). Each profile was rich in issues, perceptions, and behaviors.

The seven emergent categories from the interview data included: Reaction to Mandated Change, Sharing Ideas and Materials, Modifications of Standards Implementation, Effects on Students, Institutional Support, Logistical Issues, and Miscellaneous Comments.

Summary of CBAM LoU Findings

An analysis of the empirical interview data from 16 fifth grade DoDDS mathematics teachers in this study resulted in the emergence of seven themes or categories. The categories were created from the salient characteristics that were filtered

from the data collection. The data by categories were analyzed, organized, and presented according to the Level of Use (LoU) ratings for teachers (e.g. LoU III, LoU IVA, LoU IVB, and LoU V). Five teachers were represented in each of the LoU groups, with the exception of LoU V, which consisted of only one teacher representative. The fact that only one of the fifth grade teachers from an original group of over 35 teachers was rated LoU V by certified CBAM evaluators is in itself an anomaly and may warrant further research.

The fifth grade teachers with identical LoU ratings were grouped for purposes of comparison. The grouping of teachers by LoU aided in establishing generalizations regarding their degree of implementation and their perceptions of the mandated DoDEA mathematics standards initiative.

When the categories generated by the interview data were cast against the CBAM construct, each category profile was stratified according to the degree of implementation of the mathematics standards. These profiles illustrated the perceptions and activities of DoDDS teachers at each level of implementation.

The data analysis of the seven categories by LoU revealed interesting information about the fifth grade DoDDS mathematics teachers at each LoU. Each category, when broken down by LoU, illustrated a developmental progression of teacher perceptions and activities based on the degree of implementation. On occasion, parallels and consistencies emerged in examining progressions among LoU groups across each category.

In closely analyzing the combined data from LoU III and LoU IVA teachers, in comparison to LoU IVB and LoU V teachers, a demarcation between the LoU pairs began to appear. The dramatic distinction clearly illustrated a significant difference in

attitudes, needs, issues, activities, time usage, behaviors, and pedagogy between the two groups of educators. The posture of teachers in groups LoU III and LoU IVA, when compared to LoU IVB and LoU V, were vastly different.

Significant distinctions between paired LoUs included the following (see Table IV):

TABLE IV

COMPARISON OF LOU PAIRS REGARDING STANDARDS IMPLEMENTATION

LoU III and LoU IVA Teachers Profile of Concerns and Issues	LoU IVB and LoU V Teachers Profile of Concerns and Issues
• Insufficient planning time	• Insufficient time with students
• Supplemental remediation materials to return to basics	• Supplemental enrichment and extension materials aligned with NCTM
• Top-down control	• Positive acceptance of standards
• Logistical considerations	• Frequent sophisticated sharing
• "I"-centered orientation	• Child-centered orientation
• Exhibited signs on non-compliance and constrained complacency	• Standards-based instruction
• Infrequent sharing	• Need for more computation in math
• Standards viewed as "ideal goals"	• High benefits to students
• Need for more computation in math	• Very positive student feedback
• Few benefits to students seen	• High degree of readiness
• Low degree of readiness	• Desire inservice education
• Exhibited confusion between standards and curriculum	

As illustrated in the chart above, a pronounced division existed between the LoU pairs that was indicative of a difference in perceptions, issues, and concerns. Occasionally shades of comparisons and subtle contrasts evolved on either side of the silent demarcation.

Fifth grade teachers in this study expressed additional comments regarding the DoDEA mathematics standards. LoU III, IVA, and IVB teachers discussed efforts to enhance school-home communication and to involve parents as active participants in mathematics education in schools. LoU IVA teachers related the need for peer observations and cross–grade articulation on mathematics standards and instruction.

Summary of CBAM SoC Findings

Through an examination of the perceptions and activities of teachers, a profile of the LoU III, LoU IVA, LoU IVB, and LoU V teachers emerged. The teacher profiles were developed from an analysis of the interview data. The data were organized, analyzed, and presented in seven categories created from the salient characteristics that emerged during the interviews.

The seven categories generated from the interview data approximated the stages in Hall's Stages of Concern (SoC) construct. To employ the SoC in examining the perceptions of the 16 fifth grade teachers, it is first necessary to compare the SoC stages to the categories generated from the interview data. A comparison of the SoC and the seven categories generated from the interview data revealed significant patterns regarding the variation in the degree of mathematics standards implementation among teachers. Categories including Reaction to Mandated Change, Impact on Institutional Support and

Miscellaneous Comments fell within the Personal Concerns dimension of the SoC, while Logistics, Modifications of Standards Implementation, and Sharing of Ideas and Materials fall primarily into the Task-oriented Concerns dimension.

Essentially, six of the seven categories generated from the data corresponded directly with two of the SoC dimensions that related more to personal (I-centered) orientation, as opposed to student orientation (client-centered). Consequently, these teachers were preoccupied with Personal and Management stage issues and concerns, and were thwarted from transcending to the higher Stages of Concern. Thus, they are less likely to fully implement the innovation.

Teachers who have surpassed the Self Concerns and Task-Oriented Concerns dimensions of the SoC are more able to focus their attention and energy on students, activities and behaviors that are associated with a higher degree of implementation. The only category derived from the data that was completely outside of the Self and Task-Oriented Concerns was Effects of Students. Only LoU IVB and LoU V teachers indicated that this was significant to them. This helps explain why a variance existed in the degree of implementation of the DoDEA mathematics standards by the fifth grade teachers in this study. In the analysis of the teacher interview data, it was significant to note that most of the categories of issues and concerns expressed by teachers related closely to the Self and Task-Oriented Concerns on the SoC.

However, it was predictable that some of the teachers transcended the "I"-centered stages and evolved into the "client"- centered dimension. Typically, as teachers become more experienced and skilled with an innovation, concerns change and teachers tend to move away from "I"- centered behavior into "client"- centered behaviors (Hall &

Hord, 1987). The SoC was useful in examining the developmental nature of teacher concerns and the impact of these concerns on change and new implementations.

Summary of the Integration of the LoU and SoC

The comparative analysis of the categories derived from the interview data and the Stages of Concern highlighted the parallels between them. When superimposed with the analysis of the Levels of Use (LoU) and the Stages of Concern (SoC), the relationship yielded additional insights regarding the variation in the perceptions of DoDDS teachers and their degree of mathematics standards implementation.

The 16 DoDDS fifth grade teachers of mathematics splintered into two camps. LoU III and LoU IVA teachers maintained similar perceptions. Consequently, patterns and progressions emerged in examining these LoU groups across the SoC stages and dimensions. A like pattern occurred with teachers in LoU IVB and LoU V. The demarcation separating the SoC and the data analyses referred to earlier emerged again when the relationship among the SoC, the interview data categories, and the LoU were spotlighted.

The intersection of the categories generated by interview data analysis, the SoC, and the LoU explained the similarity of the profiles of LoU III and LoU IVA teachers, as well as the differentiation of those teachers to the LoU IVB and LoU V teachers. LoU III and LoU IVA teachers resided in the SoC dimensions of Self Concerns and Task-Oriented Concerns. Their implementation concerns primarily revolved around personal and management issues such as logistics, day-to-day operations, short-term activities, and a return to the basics. However, teachers in LoU IVB and LoU V were less hampered with

Management and Task-Oriented Concerns, and were therefore able to concentrate more on Impact-Oriented activities, such as self-renewal and professional growth.

Integrating the SoC with the LoU helped to analyze and explain why a variance exists in the degree of implementation of the DoDEA mathematics standards by the fifth grade teachers in this study. The comparative process also demonstrated the powerful influence teacher perceptions have on the success and impact of new innovations.

Areas for Further Study

Only one of the fifth grade teachers in this study was rated LoU V by certified CBAM evaluators. This in itself is highly significant. It is desirable that teachers at all grade levels progress with new implementations to a level exceeding the Mechanical (LoU III) and Routine (LoU IVA) stages. LoU V teachers, by definition, combine their efforts to use the innovation with related activities of colleagues to achieve a collective impact on students (Loucks, Newlove & Hall, 1998).

This particular fifth grade school teacher stood out among the others in this study. The elementary educator surfaced from a population of over 35 recorded interviews of fifth grade teachers in the original DoDEA Systematic Linking of Instruction, Curriculum and Evaluation (SLICE) research project. This anomaly warrants further explanation to comprehend what traits and variables are reflected in determining why some teachers surpass others in implementing new innovations.

As a sequel to this study on mandatory schoolwide implementations, a parallel study examining the issues presented from an altered perspective might provide new insights. Juxtaposing other distinguishing features of educators such as years of

experience, gender, location, and grade levels to explore the effects on the degree of implementation might prove enlightening.

A study on the relationship between the degree of mathematics standards implementation and the effect on student achievement might be illuminating to both teachers and administrators, and perhaps foster a stronger commitment to standards-based instruction.

Implications and Recommendations

This study yields significant implications for adding to the knowledge base of research on the implementation of new innovations in schools. It also serves to inform and improve practice regarding the implementation of mandated curricular standards in DoDDS schools. Findings from this study offers information regarding the successful implementation of innovations to staff development specialists, administrators, classroom teachers, school improvement teams, and district-level personnel who are in charge of program implementations.

Theory

Hall's Concerns Based Adoption Model (CBAM) proved useful in determining the degree of implementation of the DoDEA mathematics standards for the 16 fifth grade teachers in this study. The construct was also valuable in exploring the perceptions, activities, and behaviors of the teachers involved in implementing the standards. Both the LoU and SoC dimensions of the CBAM construct were critical components in accomplishing the purposes of this study. Analysis of the data through the use of the

CBAM framework and the integration of the Levels of Use and Stages of Concern provided insights into the variation and intensity of feelings, issues, and concerns of teachers at each Level of Use surrounding the implementation of the mandated mathematics standards. The combination of the LoU and SoC instrument data in this study offered a more powerful and comprehensive understanding and explanation of the varying degrees of implementation and perceptions of mathematics standards by the teachers in this study. The integration of the LoU and SoC aided in the identification of the degree of standards implementation, the stages of concern of individual teachers, and the predictable teacher activities and behaviors that are associated with the profiles generated.

The findings of this study indicated that there exists a close connection in traits and profiles among LoU III/LoU IVA teachers, and also between LoU IVB/LoU V teachers. A clearly defined demarcation between the paired LoU groups was seen in the analysis of the data. LoU III/LoU IVA teachers demonstrated strikingly similar characteristics including a more discipline-based, teacher-centered ideology and pedagogy. LoU IVB/LoU V teachers exhibited traits that are perceived as more child-oriented. These grouping patterns are significant in terms of planning, monitoring and supervising instruction, identifying training needs, and offering appropriate support for teachers in these distinctly separate categories. Findings suggest that teachers might be grouped into three general categories for inservice education: LoU 0, I, and II; LoU III and IVA; and LoU IVB and V. Though no LoU VI teachers were identified in this study, LoU VI teachers might require individualized assistance and training since they would have progressed far beyond the other LoU groups in terms of curriculum standards implementation.

Research

Systemic reform in mathematics through the use of standards-based instruction is a lengthy and complex process. Research and literature on curriculum standards and mandated change implementations offer evidence of the intricacy of the procedures involved in these issues. The literature is replete with examples of unsuccessful educational reform attempts. As CBAM research postulates, unsuccessful innovations and initiatives may actually be the result of failed implementations (Hall & Hord, 1987).

This explanatory case study (Yin, 1994) examined the degree of implementation of the DoDEA mandated mathematics standards. The perceptions and behaviors of 16 fifth grade teachers who were responsible for implementing the curriculum standards were investigated. The relationship between perceptions of teachers about the use of the standards, and the degree of standards implementation in classrooms, were found to be significant.

This study added to the existing knowledge base of the mathematics curriculum standards implementation in the Department of Defense Dependents Schools. It is anticipated that many of the specific findings of this study can be applied to the implementation of future educational initiatives since successful reform efforts require that educators at all levels are cognizant of the process and impact of new implementations.

Practice

The findings of this study seem significant to educational practice for a variety of reasons. The implications of the study may have far reaching consequences for students,

teachers, parents, and the community in terms of affecting successful school implementations. District-level curriculum coordinators and staff developers, as well as school-level administrators, teachers, and school improvement teams may benefit from the knowledge gained from this study.

For teachers, this study might provide important evaluative information regarding the relationship between perceptions and feelings about the DoDEA mathematics standards and the actual degree of math standards implementation. The variability between a teacher's self-description of the use of the math standards during the LoU interview and the degree of implementation of the math standards may be extensive.

The study may reveal valuable insights into why some teachers approach new implementations in a different manner than others. An illumination regarding what factors contributes to a higher degree of math standards implementation may result. The study results may also be used to assist teachers by identifying individual training needs in mathematics standards.

Administrators, though well intentioned, sometimes underestimate the complexities of mandating new school policies and practices. The results of this investigation may offer administrators and other educational leaders significant information regarding considerations prior to undertaking new school initiatives and implementations. Considerations such as the amount of time required to successfully affect a new implementation are crucial, as seen in this study. Variations and improvements of current implementation practices and processes might evolve from this study. Administrators may better recognize and support standards-based instruction, and understand the need for professional development for all stakeholders.

Involving teachers in the discussion, planning and decision-making process from the onset of new initiatives is an essential component of affecting successful school implementations. Teachers must be valued for what they know. Their practical thoughts, insights, and experiences must be appreciated and considered before mandating new programs and implementations.

As a major function of their position, district level and above curriculum coordinators have the responsibility of coordinating the selection, implementation, monitoring and frequently assessing curricula in schools and classrooms. What is assessed and how it is assessed communicates to educators what is valued. This study might benefit mathematics curriculum coordinators in their role as liaison. It is also conjectured that the findings of this study may have generic implications to other standards-driven curricular areas.

Staff development specialists are tasked with the responsibility of assessing the professional development needs of educators and implementing a variety of venues for those needs to be met. This study may add to the knowledge base of information concerning the impact of standards in the classroom, and provide staff developers with a direction and emphasis in the planning and implementation of staff development programs for school districts.

The school improvement process has become a significant means of examining the progress of students in a school. This process focuses the concerted efforts of all staff members on implementing practices to improve education to increase achievement for all students. This goal requires an extensive dedication of time and energy on the part of all stakeholders. Initiatives that demand an intensive degree of devotion from an all-

encompassing task force should be guided by research. This study might provide insight into the collaborative process and complex procedures involved in affecting new initiatives and implementations.

This research also offers significant implications in terms of teacher preservice education as well as for teachers currently in the field. The data from this study illustrates a relationship between low stages of concern, low levels of curriculum implementation, and teacher-centered ideology and pedagogy. Teachers who continue to exhibit low levels of curriculum standards implementation after the innovation had been in effect for several years demonstrated similar characteristics including a more teacher-centered approach to instruction. Institutions of higher education need to prepare prospective teachers versed in a more child-centered ideology, or constructivist approach, as opposed to more traditional educational practices.

Teacher-centered classroom instruction espouses a more discipline-based philosophy and pedagogy whereby the teacher's role includes controlling and manipulating the thoughts and behaviors of students. This is the antithesis of the child-centered approach to learning as seen in more constructivist modes of instruction. As demonstrated in the comparisons and demarcation between LoU III/LoU IVA and LoU IVB/LoU V teachers, the former group seemed to tenaciously hold on to and exhibit more traditional educational pedagogy and values. These teachers favored a return to the basics and were much more preoccupied with "I"-centered issues and concerns than were the LoU IV B/LoU V teachers.

Consequently, a differentiated approach to inservice educaction is needed for the clusters of teachers in the paired LoU combinations. Teachers who reside at the lower

stages of concern ("I"-centered) will need appropriate training and support to escalate to the higher (child-centered) stages. Teachers who currently exhibit traits consistent with a more student-oriented ideology who are functioning at a higher LoU of the implementation will have distinctly different needs, and therefore will require very different training than teachers at lower LoU and SoC levels. The idea of grouping educators by LoU pairs (LoU III/LoU IVA and LoU IVB/LoU V) is an important consideration for higher education institutions and staff developers in planning effective training for teachers at these levels.

Specific findings from this study offer other practical considerations that might affect educational practices. The specific comments, suggestions and themes from the teacher interviews should be seriously considered. Becoming aware of the types of concerns and issues from teacher perspectives will enable those in support roles to offer the services necessary to promote success. A few of the most significant issues regarding the mathematics implementation are highlighted below:

- Insufficient time as a barrier to successful implementations.
- Availability of appropriate curriculum materials is lacking.
- Collaboration and cross-grade articulation are needed.
- More inservice education on mathematics standards is needed for educators at all levels.
- Curricular materials should closely match the standards.
- Feedback from students and others should be sought and used.
- Current research should guide educational decisions.

An intended outcome of this study was an understanding and appreciation of the linkage between teacher perceptions of the DoDEA mathematics standards and the degree of implementation at each level of implementation. An additional expectation included insights into future planning of innovations in DoDEA. An unintended outcome appeared in the form of an anomaly, which surfaced during the data analysis. The fact that only one fifth grade teacher in this study was rated in the LoU V category by certified CBAM evaluators is worthy of study.

Conducting research and reviewing the literature on the topics of mathematics standards, the change process, and the implementation of innovations emphasizes their relative importance. Significant improvements in pedagogy often result from the systematic development of research-based knowledge. This research study was intended to assist in that endeavor.

Conclusions and Commentary

The ultimate determination of the effects of standards-based education is whether students in classrooms are learning, whether the teachers are equipped to address the learning needs of their students, and whether the community is supportive of the education goals (Berman & Joftus, 1998).

Standards-based mathematics instruction is much more than logistics, mandates, readiness, modifications, sharing, collaborating, manipulatives, supplemental materials, constructivism, and profiles. Though all of the above are important ingredients for successful educational opportunities and experiences for children, the primary catalyst for

change is the classroom teacher. As pointed out by Senge, it is a myth that "Significant change only occurs when it is driven from the top" (Senge, 1999, p. 10).

Reform in education means a shift in thinking. Teachers must first acquire new pedagogical skills and knowledge. But the teacher cannot do it alone. Teachers must be provided with the necessary tools and support to effect positive changes for students. But at an even more fundamental level, standards-based mathematics education may require changes in belief systems about the nature of mathematics and how it should be taught.

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APPENDIXES

APPENDIX A

UNION NOTIFICATION

DEPARTMENT OF DEFENSE
EDUCATION ACTIVITY
PERSONNEL CENTER
4040 NORTH FAIRFAX DRIVE
ARLINGTON, VIRGINIA 22203-1634

JUL 24 1998

Dr. Marie Sainz-Funaro
President
Overseas Federation of Teachers
Cmr 426, Box 541
APO AE 09613

Dear Dr. Sainz-Funaro:

As part of our continuing efforts to foster cooperative relationships, I wanted to give you a heads up on an evaluation project being scheduled for this coming school year. As part of The Systematic Linking of Instruction, Curriculum and Evaluation (SLICE), the DoDEA Research and Evaluation Branch plans to conduct a Math Implementation Evaluation during SY 98-99 in districts containing your bargaining unit members. A one page outline of SLICE and the evaluation is attached to provide you some information on the mission, design and data collection methods. We will be asking 288 randomly selected math educators to participate in the evaluation study. District liaisons will be trained to conduct teacher observations and interviews. I want to assure you that the results of the observations and the study will NOT be used in the performance evaluation of any participating teacher.

We will be completing the selection process by August 15 and will provide you with a list of educators selected in your bargaining unit. We anticipate notifying teachers of their selection to participate in this study by September 1.

I am sure that you will have many questions about this research study. I recommend we place this on the agenda for the JLMC to be conducted on September 29 in Incirlik. We could request the Turkey District liaison attend the meeting to answer any concerns you may have about the study.

Please feel free to contact me if you have any immediate questions about the Math Implementation Evaluation/SLICE.

Sincerely,

Louise Schuster

Louise Schuster
Chief of Labor Relations

Attachments:
As stated

APPENDIX B

INFORMATIONAL LETTER TO THE TEACHERS THROUGH AREA AND DISTRICT SUPERINTENDENTS

DEPARTMENT OF DEFENSE
EDUCATION ACTIVITY
4040 NORTH FAIRFAX DRIVE
ARLINGTON, VIRGINIA 22203-1635

SEP 15 1998

MEMORANDUM FOR AREA SUPERINTENDENTS, DODEA
DISTRICT SUPERINTENDENTS, DODDS

SUBJECT : Systematic Linking of Instruction, Curriculum and Evaluation (SLICE)

During school year (SY) 1997-98, the Office of the Associate Director, Accountability, Assessment, Research and Evaluation (AARE) initiated a program to systematically link instruction, curriculum and evaluation (SLICE). Staff members from education, research, evaluation and professional development collaborated with Dr. Gene Hall of the University of Northern Colorado to focus on the systemwide linking of the implementation of curriculum programs to student outcomes, which is a vital concept in education. Dr. Hall's Concerns-Based Adoption Model (CBAM) serves as the theoretical basis and practical procedures for the program. CBAM addresses the degree to which a curriculum program has been implemented (Levels of Use), which components of the program have been implemented (Innovation Configuration Map) and the concerns that teachers and other staff have about implementing the program (Stages of Concern). Years of research have validated this model of evaluating implementation of educational programs.

This SY 1998-99, the SLICE program addresses two major systemwide efforts within The Department of Defense Dependent Schools (DoDDS): Mathematics and Social Studies. Both efforts represent important collaboration in action research between headquarters and district offices.

The Mathematics Implementation Evaluation Study builds upon the study conducted in the Hessen district over the past 4 years, linking implementation of math standards to student outcomes. Each DoDDS district this year is planned to participate in this research that aims to identify specific practices that make a difference in student success. We will be selecting randomly a systemwide sample of 288 DoDDS teachers of math to study how different teaching practices link to differences in student achievement by gender and ethnicity.

The Social Studies Standards Evaluation Study focuses this year on gathering baseline data in all DoDDS districts on implementation of social studies standards. The results of the study will be used by social studies liaisons to plan appropriate professional development.

Specific details of the social studies and mathematics studies will be sent to all DoDDS superintendents and principals in September 1998. The reports of results will be shared with all schools in fall 1999. Results will assist all educators by identifying which specific teaching practices have the most impact on student achievement.

Attached is an information paper on the math study that can be used to inform other educators in your district about the study.

We look forward to this collaborative work to improve education for our students. Representatives from all DoDDS districts participated in the August CBAM Workshop in Breckenridge, Colorado. They were excellent participants and left the workshop with a commitment to the studies. We believe this capacity building in the districts will benefit our teachers and students.

Your support of this project is appreciated.

Lillian Gonzalez
Director

Attachment:
As stated

APPENDIX C

LEVELS OF USE QUESTIONNAIRE

LEVELS OF USE INTERVIEW QUESTIONS

• O-II/III-VI Are you currently using _____?

If NO, continue. *If YES, turn page.* →

• Have you ever used _____ in the past?

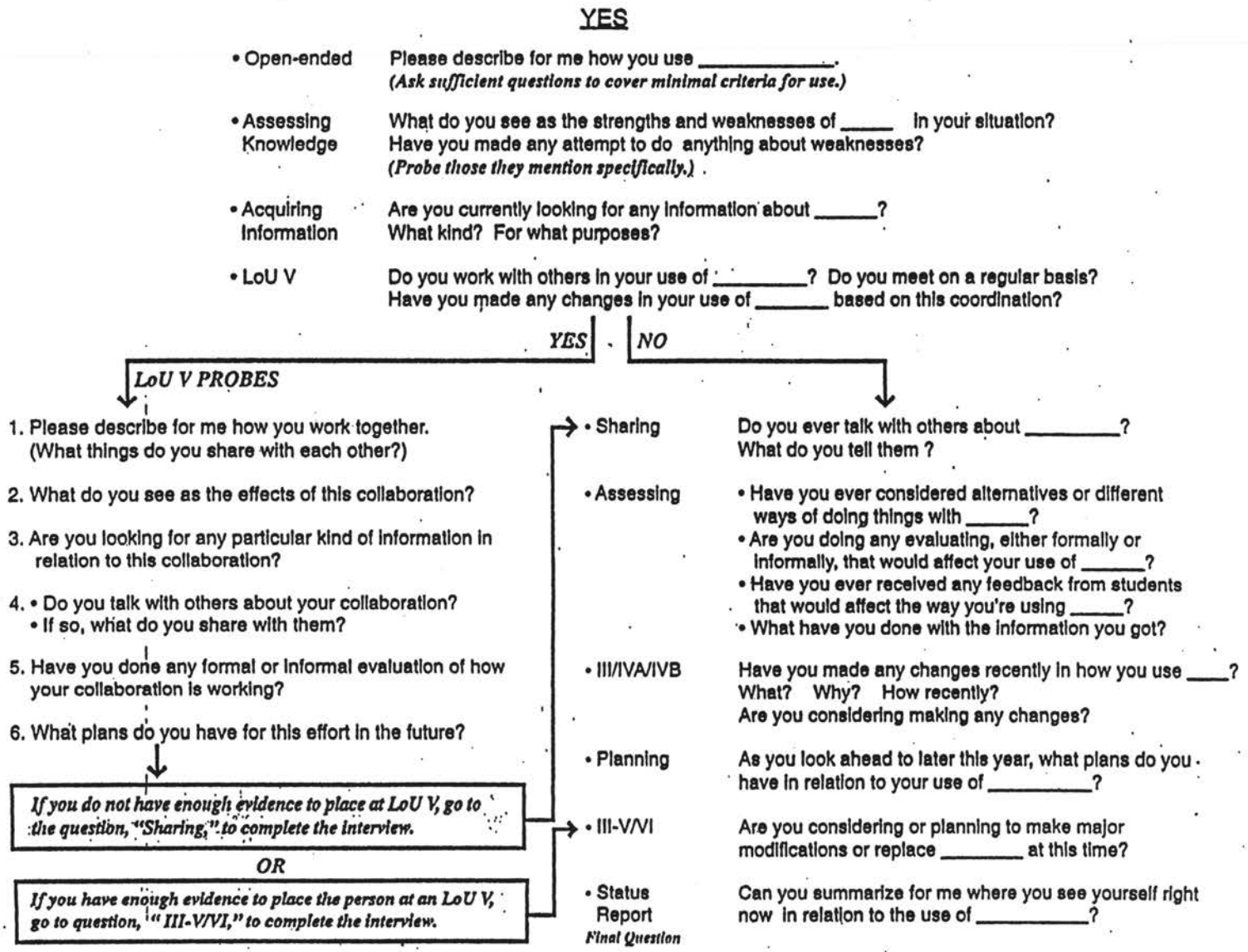
YES *NO*

PAST USERS

1. If so, when?
2. Why did you stop?
3. Can you describe for me
   - how you organized your use of _____,
   - what problems you found,
   - what its effects appeared to be on students?
4. When you assess _____ at this point in time, what do you see as the strengths and weaknesses?

Completed interview by continuing with Level of Use

• O/I-II	Have you made a decision to use _____ in the future?
• I/II	If so, when will you begin use?
• Knowledge	Can you describe _____ for me as you see it?
• Acquiring Information	Are you currently looking for any information about _____? What kinds? For what purposes?
• Knowledge	What do you see as the strengths and weaknesses of _____ in your situation?
• Assessing	At this point in time, what kinds of questions are you asking about _____? *(Give examples to illustrate, if necessary.)*
• Sharing	Do you ever talk with others and share information about _____? What do you share?
• Planning	What are you planning with respect to _____? Can you tell me about any preparation or plans you have been making for the use of _____?
• Status Reporting	Can you summarize for me where you see yourself right now in relation to the use of _____?


YES
• Open-ended
Please describe for me how you use _____.
(Ask sufficient questions to cover minimal criteria for use.)
• Assessing Knowledge
What do you see as the strengths and weaknesses of _____ in your situation?
Have you made any attempt to do anything about weaknesses?
(Probe those they mention specifically.)
• Acquiring Information
Are you currently looking for any information about _____?
What kind? For what purposes?
• LoU V
Do you work with others in your use of _____? Do you meet on a regular basis?
Have you made any changes in your use of _____ based on this coordination?
YES
NO
LoU V PROBES
1. Please describe for me how you work together. (What things do you share with each other?)
2. What do you see as the effects of this collaboration?
3. Are you looking for any particular kind of information in relation to this collaboration?
4. • Do you talk with others about your collaboration?
• If so, what do you share with them?
5. Have you done any formal or informal evaluation of how your collaboration is working?
6. What plans do you have for this effort in the future?
If you do not have enough evidence to place at LoU V, go to the question, "Sharing," to complete the interview.
OR
If you have enough evidence to place the person at an LoU V, go to question, "III-V/VI," to complete the interview.
• Sharing
Do you ever talk with others about _____?
What do you tell them ?
• Assessing
• Have you ever considered alternatives or different ways of doing things with _____?
• Are you doing any evaluating, either formally or informally, that would affect your use of _____?
• Have you ever received any feedback from students that would affect the way you're using _____?
• What have you done with the information you got?
• III/IVA/IVB
Have you made any changes recently in how you use ____?
What? Why? How recently?
Are you considering making any changes?
• Planning
As you look ahead to later this year, what plans do you have in relation to your use of _____?
• III-V/VI
Are you considering or planning to make major modifications or replace _____ at this time?
• Status Report
Final Question
Can you summarize for me where you see yourself right now in relation to the use of _____?

APPENDIX D

PERMISSION FROM DEPARTMENT OF DEFENSE EDUCATION ACTIVITY TO PURSUE RESEARCH

DEPARTMENT OF DEFENSE
EDUCATION ACTIVITY
4040 NORTH FAIRFAX DRIVE
ARLINGTON, VIRGINIA 22203-1635

October 25, 1999

Ms. Jean Silvernail &
Mr. Bill Ramos
4040 N. Fairfax Drive,
Arlington, VA 22203

Dear Ms. Silvernail & Mr. Ramos:

Your research "Comparative Analysis of: LOU Math Interviews, Mathematics Configuration Map, DoDEA Standardized Testing", has been approved by the DoDEA Research Committee.

Approval of your research allows you to proceed with the research as described. It is not an endorsement and does not compel any personnel of the DoDEA system to participate. Parent, student and staff participation is strictly voluntary, and informed consent is required before any data can be collected on students.

Please contact me at (703) 696-4385 if you have any questions.

Sincerely,

Kristin Medhurst
Specialist, Research and Evaluation

APPENDIX E

INSTITUTIONAL REVIEW BOARD

EXEMPTION NOTIFICATION

OKLAHOMA STATE UNIVERSITY

OSU

Thomas C. Collins
Vice President for Research
203 Whitehurst
Stillwater, Oklahoma 74078-1020
405-744-6501, FAX 405-744-6244
collins@okstate.edu

Memorandum

To: Jean Silvernail and Bill Ramos
From: Carol Olson, Director of Planning, Strategic Research Development, and University Research Compliance
Date: March 3, 2000
Subject: Institutional Review Board Exception

Given that the research you propose for your dissertations uses data sets generated by the Department of Defense Dependent Schools and you will not be interacting with human subjects, no Institutional Review is necessary.

VITA

William D. Ramos

Candidate for the Degree of

Doctor of Education

Thesis: THE RELATIONSHIP BETWEEN DEGREE OF IMPLEMENTATION AND PERCEPTIONS OF ELEMENTARY TEACHERS REGARDING MATHEMATICS STANDARDS

Major Field: Educational Administration

Biographical:

Personal Data: Born in Saratoga Springs, New York, on June 2, 1950, the son of Manuel and Florence Ramos.

Education: Graduated from St. Peter's Academy, Saratoga Springs, New York in June 1968; received Associate of Arts degree in Liberal Arts from Adirondack Community College, Glens Falls, New York in 1970; received Bachelor of Science degree in Elementary Education from the State University of New York, Oneonta, New York in 1972; received Master of Arts in Gifted and Talented Education from the University of South Florida, Tampa, Florida in 1987; received Master of Science and Certificate of Advanced Studies in Educational Administration from the State University of New York, Plattsburgh, New York in 1989. Completed the requirements for the degree of Doctor of Education at Oklahoma State University in July, 2000.

Experience: Taught elementary school in central New York; classroom teacher, consultant/teacher of Gifted Education K-12, Education Program Manager, Assistant Principal, and Principal in Department of Defense Dependents Schools in Germany, Italy, Japan, and the United Kingdom; currently Principal of Burrows Elementary School on Quantico Marine Base, Quantico, Virginia.

Professional Memberships: Phi Delta Kappan, Association for Supervision and Curriculum Development, National Association of Elementary School Principals, Pi Lambda Theta, Kappa Delta Pi, and Phi Kappa Phi.