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ABSTRACT

This study examined factors prompting K-12 teachers to adopt statewide educational reform measures being promoted by Partnerships Advancing the Learning of Math and Science (PALMS), a cooperative statewide systemic initiative, funded by the Massachusetts Department of Education and the National Science Foundation, to implement state reform measures outlined in the 1993 Educational Reform Act and the Massachusetts Curriculum Framework Teacher Guides. Researchers examined the implementation process of the 1993 Educational Reform measures within one urban school district. Sixty-two teachers completed surveys examining initial factors that allowed them to make a paradigm shift so change could occur, as well as factors that moved them from non-utilization to routine utilization of the PALMS approach. Teachers' schools had been involved in the change process for 6 years. Initial influences responsible for creating a paradigm shift so change could occur included: quality of training, the approach being good for students, and the approach fitting the teacher's philosophy. Factors that influenced teachers' attitudes toward utilizing the approach included: training, class participation in an event utilizing the approach, and utilization by colleagues. Events had more influence on teacher utilization than did people. (Contains 207 references.) (SM)

Promoting School Renewal Through Change Agent Strategies:

Factors Influencing Teacher Adoption of a Statewide Change Initiative

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Abstract

This research study examined the factors that prompted K-12 teachers to adopt the statewide educational reform measures being promoted throughout Massachusetts by the Partnerships Advancing the Learning of Math and Science (PALMS). PALMS was a Cooperative Statewide Systemic Initiative funded by the Massachusetts Department of Education and the National Science Foundation to implement the state reform measures outlined in the 1993 Educational Reform Act and the Massachusetts Curriculum Framework Teacher Guides. This study dealt with the implementation process of the 1993 Educational Reform Measures within the area of this urban school district.

Sixty-two urban Southeastern Massachusetts teachers responded to a survey that identified the initial factor that allowed them to make a paradigm shift so change could occur, as well as the factors that transformed them from a state of non-utilization to routine utilization of the PALMS approach. The schools in this urban Southeastern Massachusetts area had been involved in the change process for the past six years when the participants identified the significant factors that change agents need to pay attention to when planning implementation initiatives to promote educational change in school systems. This procedural method was selected based on the fact that the change literature emphasized that complex change took 5 years or more to be implemented, and that teachers needed time to implement, experience and understand an innovation before they could make a meaningful operational judgment about the innovation or change (Fullan & Stiegebauer, 1991; Fullan, 1993; Harvey 1990).

The qualitative data revealed the importance of quality training, the fact that the approach must be good for students, and it must fit the teacher's philosophy as initial influencing factors responsible for creating a paradigm shift so change can occur. The quantitative data suggested that training, the class participating in an event utilizing the approach, the Education Reform Act, Family Math and Science Nights, state testing, trained specialists, and utilizing colleagues were factors influencing the teachers' attitudes toward utilizing the approach. The quantitative responses also indicated that events had more influence on teacher utilization than people did.

Introduction

This study involved resolving the challenges faced by change agents seeking to implement a process of educational reform within a school system. Based on lessons learned, this researcher answered what the effective influential factors were that helped move teachers along through the Change Stage Continuum from non-utilization to utilization. This study examined the responses of urban Southeastern Massachusetts educators, who described their experiences regarding the educational reform measures promoted by the Partnerships Advancing the Learning of Math and Science (PALMS) and mandated by the Education Reform Act of 1993. The returned surveys that were sent out to approximately 1,000 teachers provided the data. The information about the educators' experiences during the 6-year change process was utilized to resolve the change agent's problem by answering the question: How can a change agent effectively promote a paradigm shift in teachers that will allow change to occur within the educational system?

This action research study examined the factors that prompted K-12 teachers to adopt the statewide educational reform measures being promoted throughout the state by the PALMS Initiative. PALMS was a Cooperative Statewide Systemic Initiative funded by the Massachusetts Department of Education and the National Science Foundation to implement the state reform measures outlined in the 1993 Education Reform Act and the Massachusetts Curriculum Framework Teacher Guides. This initiative included a hands-on, inquiry-based, cooperative learning classroom teaching strategy that involved university and business partnerships actively working with teachers, administrators, policy makers, and parents implementing the curriculum reform measures into classroom teaching and learning practices throughout the state. This collective team worked with challenging content standards based on the Massachusetts Curriculum Frameworks in a rich learning environment that assisted students in creating a lasting foundation based on continuous improvement and lifelong learning that empowered the students to become productive, problem-solving citizens and workers (PALMS, 1995, October, p.2).

Project PALMS: A Statewide Systemic School Change Initiative

The PALMS approach of teaching and learning involves developing higher level critical thinking, cooperative learning, an integrated across the curriculum approach and thematic units,

constructivism, inquiry-based learning, brain based learning, accelerated learning, multiple intelligences, and learning styles.

The PALMS brochure (1995, June) distributed by the Massachusetts Department of Education simply stated the PALMS approach as "Hands-On, Minds-On Problem-Solving in Today's Classroom." The following PALMS vision statement appearing in the same brochure exemplified what this statement was all about.

> All ... students will receive a high quality, hands-on education in mathematics and in science and technology that empowers them to be productive, problem-solving citizens and workers. Partnerships among business, institutions of higher education, policy makers, governmental agencies, cultural institutions, teachers and families will create a rich learning environment and provide a lasting foundation for continual improvement. Challenging standards for content, teaching methods and equity defined in statewide curriculum frameworks will guide district practice. Learning will be active, built on discovery and reflection, and a variety of assessments will test for understanding. New teachers will enter the profession with a solid grounding in mathematics and science content and in effective strategies for engaging a diversity of learners. Experienced teachers will continually deepen their knowledge and professional skills. PALMS will be the vanguard of education reform. (PALMS, 1995, June, p.1-2)

The following PALMS Principles (PALMS, 1995, October) were used to train educators in an urban school system in Southeastern Massachusetts for the last 6 years in the teaching and learning practices required by the Education Reform Act of 1993:

Quality math and science:

- Actively engages learners;
- Emphasizes quality of understanding;
- Uses assessment to improve instruction;
- Uses cooperative and collaborative learning;
- Is accessible and equitable for all students;
- Stresses learning as a lifelong process;
- Has a problem-solving focus;
- Is hands-on and inquiry-based. (p.2)

The training for Project PALMS at the school, district, and state level involved ongoing support in the form of workshops, courses, long distance institutes, presentations, meetings, mentoring, and support groups. Assistance at the building level came from PALMS trained Lead Teachers who taught in each building. The Lead Teachers became staff resource people who provided in-building help to colleagues during the change process. Lead Teachers established a central file of science and math lesson ideas, provided hands-on classroom lessons and

demonstrations, assisted with field trips, coordinated and hosted family math and science nights, gave workshop presentations, distributed handouts on math and science curriculum ideas, participated in peer coaching sessions, and led team teaching activities. The strategies that were utilized depended on where the teachers in the building were in terms of the change process continuum and the particular help they needed or expressed an interest in at the time. This Lead Teacher Training Incentive was established to provide teachers with a supportive atmosphere and culture in the school that would help move teachers forward along the change continuum to routine utilization of the PALMS Principles in their daily teaching practices.

Workshops and courses were given by PALMS Lead Teachers, PALMS Specialists, PALMS Partnership University Professors and PALMS Partnership Museum Staff to help teachers understand the underlying teaching practices involved in the PALMS approach. The underlying teaching practices that teachers needed to understand included cooperative learning, integrated across the curriculum thematic units, constructivisim, inquiry-based learning, brain-based learning, accelerated learning, multiple intelligences, and learning styles. In the section immediately following, each of these approaches and strategies are defined in operational terms. The definitions provide a full understanding of the training that teachers received through Project PALMS, so that the teaching and learning practices required by the Education Reform Act of 1993 could be properly implemented into their daily teaching practices.

Operational Definitions Utilized in Project PALMS

PALMS

PALMS was an acronym meaning Partners Advancing the Learning in Math and Science. The PALMS initiative stemmed from a grant and cooperative agreement between the National Science Foundation and the Massachusetts Department of Education (PALMS, 1993, October, 1995, June). This approach involved using hands-on, inquiry-based cooperative learning where children used real world experiences to hypothesize, problem solve, and construct their own meaning about the world in which they live. This approach involved documenting, listing, and recording what they did, why they did it, and what they learned as an important part in the learning process as well as evaluating and sharing what was discovered with other students in the classrooms. This approach allowed students to have a voice in what they would like to learn

about a topic. Teachers begin the unit by getting a sense of the students' prior knowledge. This was done in the form of a topic web, where the students brainstormed ideas about the topic graphically displayed around the title of the unit (see Fig. 1).

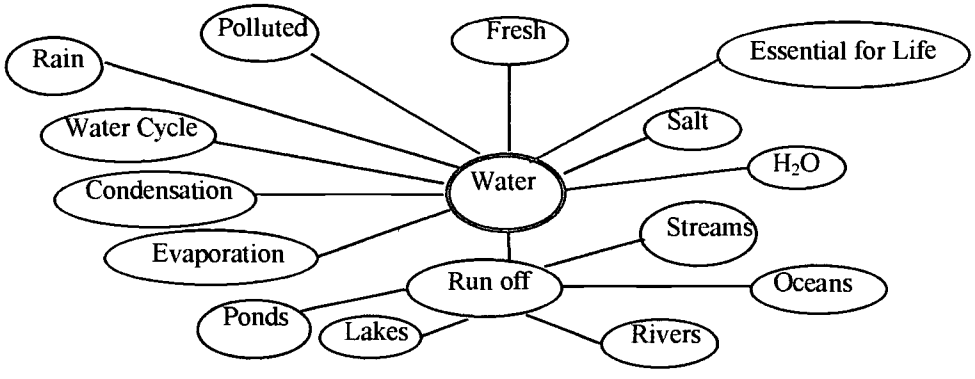

Figure 1. PALMS Topic Web Prior Knowledge Example. This is a sample topic web for a thematic unit on water demonstrating a PALMS approach strategy for obtaining student prior knowledge of topic.

After the unit of study was completed, the students went back to this topic web, using a different color to add what they learned during the unit as well as cross out any information that they found to be invalid as they studied the unit.

The next section of definitions defines the teaching and learning components utilized within a PALMS approach.

Project PALMS Teaching and Learning Components

Cooperative Learning

Cooperative Learning (Johnson & Johnson, 1994, 1995; Johnson, Johnson, & Holubec, 1990; Johnson et al., 1991; Kagan, 1992) was an approach where children worked in small groups to do an activity, lesson, or project. Children using this approach learned certain social skills needed for effective group or teamwork, such as:

- talking quietly by using a six-inch voices;
- looking face-to-face and sitting knee-to-knee with the person being communicated with during a conversation;
- listening actively, where one person speaks at a time, takes turns, and values everyone's contribution to the project.

Students also learned team-building strategies that involved coming together as a group by having a shared purpose. In cooperative learning, students performed definite task roles to carry out the necessary jobs that needed to be performed in order to complete the project. These roles included such tasks as recorder, timekeeper, cheerleader, and noise controller. The roles were rotated to give everyone a chance to try the different roles before the project ended.

Integration Across the Curriculum and Thematic Units

An Integrated Across the Curriculum Approach that utilized Thematic Units (Fogarty, 1991, 1994; Jacobs, 1989, 1997; NCR, 1993, July; NSTA, 1993; PALMS, 1994, October, 1995, June) was one in which the students used a more global approach to learn about a topic. This approach was in contrast with approaches that broke down the school curriculum into separate, isolated subjects of study. During the course of a day, week, or month, the students were taught reading, math, science, spelling, social studies, and language arts skills through their thematic unit topic research work and group projects. Through reading and learning about the thematic unit topic, students did lessons, activities, and projects that involved work in reading, math, science, spelling, social studies, and language arts.

Constructivism

Constructivism (Brooks & Brooks, 1993, 1999; D'Arcangelo, Checkley, Wurzburg, Brooks, & Brooks, 1995a; Delisle, 1997; Fosnot, 1996; Marlowe & Page, 1998; PALMS, 1994; Rutherford, 1990; Selley, 1999) was an approach by which students learned and developed meaning about their world through researching and problem solving real situations using hands-on activities and projects. The curriculum utilized a hands-on, inquiry-based, cooperative learning approach that involved students working in all the curriculum areas to resolve a problem using higher level critical thinking skills. Then, they communicated to others what they learned in the course of studying the unit in terms of what they did, what happened, and why. The teacher was a facilitator, assisting students in outlining and planning the unit of study by asking them questions that allowed students to develop insights into what they needed to do to construct their own research and experiments to resolve the issue or problem they were studying. Students made meaning of the world through their experiences.

Inquiry-Based Learning

Inquiry-based learning (Marsono, 1992; National Research Council, 1996; NCR, 1993, July; NSTA, 1993; PALMS, 1994, October; Staff at Education Development Center, 1994) was an approach similar to constructivism, in that the students were using a problem-solving approach to learn about a topic with the help of their instructor. The teacher assisted the students through the learning process as they investigated the topic together. The students were again formulating their meaning through experiments. However, the difference between inquiry-based learning and constructivism lay in the fact that in an inquiry approach, the students may be utilizing experiences that the teacher had set up or that were outlined in their science book or another course textbook. The experiences did not have to be ones that the students constructed themselves based on the problems they were trying to solve. An inquiry approach also did not necessarily involve an integrated- across-the-curriculum approach. It could simply involve a unit of study from only one subject area of the student's curriculum.

Multiple Intelligences

Multiple intelligences (Gardner, 1993) referred to the different ways that people learn, know, and understand the world. According to Gardner (1993), the goal of knowledge involved understanding the world in which we live. Gardner (1993) believed that educators must give consideration to the various ways individuals excel and display their intelligent behavior. Intelligence, according to Gardner (1993), was when a person took knowledge and appropriately applied it. Gardner (1993) believed that each person possesses all eight of the following intelligences. How people utilized the intelligences varied in degrees from person to person.

1. **Verbal - Linguistic**: ability to use language and words.
2. **Logical - Mathematical**: capacity for inductive and deductive thinking and reasoning, use of numbers, and recognition of abstract patterns.
3. **Visual - Spatial:** ability to visualize objects and spatial dimensions and create internal images and pictures.
4. **Bodily - Kinesthetic:** ability to control bodily motion.
5. **Musical - Rhythmic:** ability to recognize tonal patterns and sounds; sensitivity to rhythms and beats.

6. **Interpersonal:** capacity for person-to-person communication and relationships.

7. **Intrapersonal:** inner states of being, self-reflection.

8. **Naturalist:** ability to recognize and use distinctions in the natural world productively (The Accelerated Learning Network, 1999).

Educators needed to help students develop to their fullest capacity level in each of the multiple intelligences by providing classroom experiences that utilized the five senses in a multi-sensory learning approach.

Learning Styles

Learning styles (Bulter, K. A., 1988; Engel & Arthur, 1994; Gregorc, 1989; Keefe, 1979, 1989; Kolb, 1976, 1984; Levy, 1985, May; Mc Carthy, 1980, 1990; Myers, 1978; Myers-Briggs & Mc Caulle, 1985;) are the preferred ways individuals learn about and interpret the world through their senses and experiences. The VAK (visual, auditory, and kinesthetic) learning style identified the sensory modality that dominated an individual's learning process and made the learner feel the most comfortable in new experiences or situations (Barbe & Swssing, 1979; Engel & Arthur, 1994).

- **Visual learners** learn best by reading or seeing pictures.
- **Auditory learners** learn best by listening.
- **Kinesthetic learners** learn best by touching and doing.

Dunn and Dunn (1978)) explained that a person's preferred learning style emphasized either a deductive or inductive reasoning process, as well as a learning environment that had either an intrapersonal (working alone) or interpersonal (working with others) working style preference.

Kolb's four-category learning style model (1976, 1984) was based on the person's interaction of perception (sensing and feelings) and the processing of information (doing and watching) that resulted in obtaining of knowledge. Understanding whether a person preferred to learn through concrete experience, abstract conceptualization, reflective observation, or active experience helped teachers provide teaching and learning practices to fully maximize the student's learning potential.

Mc Carthy (1980, 1990) used Kolb's Learning Style Inventory (1976) and the theory of left-right hemispheric brain dominance (explained at the end of this learning style section) to develop the 4MAT System (Mc Carthy, 1980). This step-by-step diversified thematic unit, across the curriculum lesson format, was designed to improve the performance abilities of every student in the classroom by utilizing whole-brain learning experiences that utilized both sides of the brain to meet the learning needs of each individual student (Mc Carthy, 1980, 1990).

Katherine Briggs and her daughter, Isabel Myers, developed the Myers-Briggs Type Indicator (MBTI) based on Carl Jung's theories of human mental processing (Myers, 1978; Myers-Briggs & Mc Caulle, 1985). This 16-category personality type indicator provided teachers with another powerful tool to improve the student's performance because it helped the teacher understand the different temperament, perception, and judgment patterns utilized by the student to process learning experiences.

Understanding a student's strengths and weaknesses in terms of the innate personality and the cultural influences that affect the different personality types provided teachers with effective ways to react to and plan learning experiences. The teacher, by providing a diversified approach that incorporated the preferred style for receiving and processing information for all personality types, zeroed in on the learning strengths of all students during a curriculum unit to enhance and maximize the learning potential of each individual student. The teacher, by offering a choice of performance outcomes to demonstrate learning mastery, enhanced student performance by providing opportunities that allowed all students to communicate and demonstrate their understanding and processing of the information in a form compatible with the way they experienced and interacted with the world (La Torre, 1995, Winter; Meisgeier et al., 1989).

Teachers needed to understand their own learning styles and how their individual learning style affected their teaching and how their students learned. Bulter, K. A., (1988), utilizing Gregorc's (1989) original Mind Style® theory research on concrete sequential, abstract sequential, abstract random, and concrete random learners profiled how the teacher's individual learning styles falling within each of these categories related to the teacher's teaching style traits, and how this related to student learning and Bloom's *Taxonomy* (1956). Understanding this entire process helped enhance both teacher effectiveness and student learning.

Teachers utilizing learning styles theories to enhance classroom learning and teaching practices needed to understand how student behavior affected the teaching and learning process.

An IDEA Model *Test for Observation and Application of Behavior Styles* (Garcea, Klise, & Shapiro, 1987) which broke student behavior into four specific categorical styles (affiliative, expressive, inquisitive, and directive) helped teachers understand why the same classroom lesson and/or activity caused both positive and negative student reactions. This test, which was easy to administer and interpret, provided another tool to help teachers maximize student learning.

Learning styles were also methods that identified whether a person had right- or left-brain hemispheric dominance (Blakeslee, 1980; Gazzaniga, 1985, 1992; Levy, 1985, May; Segalowitz, 1983; Springer & Deutsch, 1981).

- **Left brain dominance** involved reasoning skills that were logical, sequential, rational, analytic, objective and parts to whole or step by step segments building up to an understanding of the entire concept.

- **Right brain dominance** involved reasoning skills that were random, intuitive, holistic, synthesized, and subjective. Right brain learners reason and think in terms of whole to parts or global conceptual learning.

Brain-Based Learning

Brain-based learning (Caine & Caine, 1990, October, 1994; Cohen, 1995, September; Jensen, 1995, 1998) was an approach that involved many different strategies to provide the student with the conditions, experiences, and strategies to induce a state of consciousness in the brain that allowed optimal learning to take place. This research stressed the fact that a classroom should be a place that had a relaxed atmosphere, where mutual respect between teacher and students existed. The students needed to be supported and validated as individuals. Students needed to feel safe, secure, and relaxed within the environment of the classroom. The classroom needed to be seen as a place where the opinions of all students were valued and respected as worthwhile contributions to the classroom. Brain-based learning emphasized that students should be allowed to drink water in the classroom in order to stimulate the neurons within their brains to increase the information transmission within the brain and sensory receptors. The research for this approach also promoted having the students do brain exercises to warm up their brain functions. In addition, students did relaxed breathing activities in order to condition the brain for optimal learning. This approach emphasized the fact that all environmental conditions in the classroom affected learning. Besides the conditions already listed, this approach suggested that the classroom lighting, color, temperature, and amount of oxygen also affected student learning.

This approach further stressed the fact that individual differences within the functioning of the students' brains must be considered as an essential factor in learning.

Teachers also had to be aware of the multiple intelligences and learning styles of the students within the classroom in order to provide experiences that enhanced the learning of all the students within the room. Brain-based learning theorists suggested that both conscious and subconscious learning took place within the student's brain. Peripheral stimuli in the room affected the subconscious learning of the students. Student learning was effected on a conscious level through visual, auditory, and kinesthetic experiences. Therefore, learning experiences utilized in a Brain-based learning approach involved all five senses and supported both the left and right hemisphere activities of the brain. The learning experiences included all of Gardner's multiple intelligences in an approach that was integrated across the curriculum. Using an integrated curriculum approach was based on research findings that the brain learns by taking into account the entire experience and forming patterns to develop meaning in terms of conditions that were important for survival (Caine & Caine, 1990, October, 1994; Cohen, 1995, September: Jensen, 1995). The attention of the brain was driven by emotion, and attention drove learning and memory. The brain only stored useful information that the attentional system within the brain determined was important. This indicated why it was important for learning experiences to be related to the real world experiences of the students.

Accelerated Learning

Accelerated learning (Dryden & Vos, 1993; Grassi, 1996; Jensen, 1995; Lozanov, 1975; Rose, 1985; Rose & Nicholl, 1998, March) was an approach in which teachers began each day with opening rituals involving brain warm-up relaxing activities and visualizations that reduced the student's stress level. Accelerated learning tapped into both the conscious and subconscious learning levels of the student's brain. Colorful teaching charts emphasizing critical information about current study units hanging strategically around the room provided the peripheral stimulation which accessed the student's subconscious and allowed subliminal learning to take place (Lozanov, 1975). According to Lozanov, the subconscious level was where 90% of our optimal learning experiences took place. Lozanov's research indicated that people tended to retain information over a longer period of time when it was received on the subconscious level. Teachers, because of the strong effect of subliminal learning on students, according to Lozanov,

had to be conscious of the influence their attitude had on the student's learning process in terms of the intonation of their voice, smile, gestures, movements, and clothes.

Lozanov also emphasized the importance of utilizing Baroque Period (1600-1750) background music without lyrics that had a largo tempo of 60 – 72 beats per minute to enhance optimal student learning performance. Grassi (1993a, 1993b) explained that playing music by Vivaldi, Bach, Telemann, Albinoni, and/or Halpern as the student entered school in the morning had a relaxing effect on the student's mind and helped the student prepare for the day's learning activities.

Grassi stressed the importance of utilizing the following six basic elements of the Accelerated Learning Process in Schools (ALPS) method that utilized Lozanov's original research and the Society for Accelerative Learning and Teaching (SALT) in order to enhance student learning:

1. **Identities** - The students took on new identities to circumvent the effectiveness of any learning inhibitors they personally had.

2. **Decoding** - This involved vocabulary building to support optimal learning experiences throughout the course of the unit.

3. **Active Concert** - The students took part in a small dramatization utilizing the new words of this unit in a small skit or play. During an active concert, classical music from the period of 1750-1820 was utilized as a "carrier wave" for the information the students were learning about in the unit. The music of Beethoven, Brahms, Mozart and Tchaikovsky assisted the teacher in utilizing the voice to emphasize key points of information during 5-10 minute script readings for elementary students or 15-20 minutes readings for junior high and high school students.

4. **Passive Concert** - A story was read aloud to the class while music that had a rhythmic beat of 60 - 72 beats per minute was played in the background. This story gave factual information through very descriptive language that awakened all five senses and stimulated the student's visualization mechanisms in the brain in order to enhance learning by utilizing the brain's long-term memory system.

5. **Activations** - Lessons and activities involved active participation in learning information that was related to the unit being studied. The teacher planned a wide variety of fun-filled learning activities that utilized the information to be learned in many ways.

6. **Culminating Activities** – These activities reviewed and celebrated the learning that had taken place. (Grassi, 1993b)

The teaching and learning components utilized in the PALMS approach to enhance and maximize all students to their fullest learning potential involving cooperative learning,

integration across the curriculum and thematic units, constructivism, inquiry-based learning, multiple intelligences, learning styles, brain-based learning, and accelerated learning have been defined in this section. The next section of operational definitions describes the support personnel and methods utilized by Project PALMS to assist teachers during the change implementation process.

Project PALMS' Change Implementation Teacher Support Personnel and Methods

Lead Teachers and PALMS Specialists were highly trained district school department staff members who assisted teachers in moving along the change process continuum to routine implementation of the innovation. PALMS Partnership support staff members also helped move teachers along the change process continuum. However, they were professionals who worked for external agencies outside of the school district. Both school district and external change agents used support groups, team teaching, peer coaching, and mentoring as supportive methods to assist teachers in implementing innovations into their routine classroom teaching and learning practices.

PALMS Lead Teachers

PALMS Lead Teachers were teachers who had received in-depth, high quality training in the latest research for teaching mathematics, science, and technology in order to take this training back to their respective schools and share the knowledge with their colleagues. The Lead Teacher training program provided by Project PALMS was a collaborative effort involving a group of selected teachers and their school districts, plus a university and museum partnership and the State Department of Education. The purpose of this in-depth training was for Lead Teachers to develop full understanding of the inquiry-based, problem-solving, cooperative learning, constructivist approach supported by the State Curriculum Frameworks and 1993 Educational Reform Act.

PALMS Specialist

A PALMS Specialist was an educator who had undergone substantial training in hands-on mathematics and science instruction. PALMS Specialists were certified by the State Department of Education and the National Science Foundation through an intensive application and interview

process as qualified change agents capable of sharing their knowledge, expertise, and training with colleagues within their school districts. Many PALMS Specialists were on leave from their regular teaching duties so they could be available full-time to provide mentoring, training, and assistance to educators during this Systemic School Change Initiative to implement the teaching and learning practices required in the 1993 Educational Reform Act. Many PALMS Specialists served as active members on their district-wide leadership teams (PALMS, 1993).

PALMS Partnerships

PALMS Partnerships consisted of university professors and museum staff located in the surrounding community of the school district, who worked in conjunction with the Massachusetts Department of Education liaison representative, local school district personnel, businessmen, and parents to form a systemic, school district-wide leadership team. This leadership team supported and promoted the teaching and learning of mathematics and science by sharing their expertise and resources with teachers in the school district (PALMS, 1993, 1995, October).

Support Groups

Support groups consisted of educators who met informally on a regular basis to improve their professional skills in order to better meet the needs of the students they served. Many support groups did not have leaders. Others, like many in this study, were organized by Lead Teachers or PALMS Specialists to meet the needs of colleagues by easing the stress and confusion felt during the transition stages of implementing a major systemic educational change within a school. The support groups were a means of sharing information, problems, and concerns about the innovation being implemented in a relaxed social setting while sharing conversation and refreshments. Support groups took away the isolation factor of teachers moving through the change process alone. They also provided the members with the synergistic energy that developed as a result of sharing "how to" concerns and problems in an atmosphere of mutual respect and caring which nurtured and developed the common purpose and shared goals of the group (Biott, 1992; Duckworth, 1997; Edge, 1992; Friend & Cook, 1991; Grohol & Carr, 1996, June; Senge, 1990; Senge et al., 1994). Participating in study support groups improved the attitudes, knowledge, and understanding of teachers for good teaching and learning practices,

while it helped them develop a school culture that expedited the improvement change process by developing teacher ownership in the school improvement innovation (Francis, Hirsh, & Rowland, 1994, Spring; Murphy, 1992, November).

Team Teaching

Team teaching was when two or more teachers collaborated, problem solved, planned for, and taught a common group of students. Team teaching involved sharing classroom management responsibilities for materials, textbooks, equipment, and resources. Teachers working in a team-teaching environment needed a common planning time available in their schedules to collaborate and plan effectively in order to provide students with a quality program ("Common co-teaching issues," 1997, November-December; Ripley, 1996).

Team-teaching situations were both formal and informal. Formal teams usually involved a regular education teacher and a teacher with specialized training such as a Chapter I teacher or a special education teacher who shared teaching responsibilities on an all-day basis, or on a specific allotted time basis each day or several times per week (Dieker & Barnett, 1996, September-October; Walther-Thomas, Bryant, & Land, 1996, July). Formal teams at the junior high and high school level often involved cross-disciplinary or interdisciplinary teams of teachers working with a specific group of students (Erb, 1997; Powell & Mills, 1994, November, 1995).

Informal team teaching consisted of two teachers just bringing their separate classroom groups together for a particular project, lesson, or subject area. For the purpose of this research project, the specific form of team teaching was not important. The team could be a formal district-established team or an informal team. The team could consist of a Lead Teacher or PALMS Specialist working with a teacher on a unit so that the classroom teacher saw firsthand how to conduct a unit or lesson utilizing this approach. The teams could be composed of two colleagues working together to assist each other with the practical application of this approach in order to have more adult facilitators available to work with the students in groups and manage equipment and resources in an efficient, timely manner. The key factor for this research project was that the team was collaborating, planning, and working together to incorporate the teaching and learning practices of the PALMS into classroom practice so that all students could develop to their fullest potential as emphasized in the 1993 Educational Reform Act.

Peer Coaching

Peer coaching involved two teachers collaborating and observing one another regarding teaching and curriculum practices. It was a supportive training method for self-improvement. The focus of peer coaching was to improve the participant's teaching practices. The teacher doing the observing was gaining ideas for working with students from the teacher who was teaching the lesson. In peer coaching, the teacher coach and the coached teacher alternated their roles. Formal evaluative feedback on the observed lesson was not part of this process. The observing teacher merely thanked the coach teacher giving the lesson for the ideas received. The teachers learned from each other through the sharing process of planning and developing materials and then watching each other teach the lesson with a group of students. This process helped the teachers involved effectively implement and utilize the new strategies that they were currently receiving training in as part of a new, innovative approach their school system was promoting to enhance student learning (Showers & Joyce, 1996, March).

Mentoring

Mentoring involved a close developmental relationship that was built on mutual respect and a common shared commitment between a more experienced educator in a specific area, working on a regular basis over a sustained period of time with a professional colleague. The goal of mentoring was to build up the mentee's character, competence, and practical application of teaching practices in relationship to the specific educational areas being investigated. Current research on mentoring stressed the importance of careful screening, selection, and training of mentors before they started working with their mentees (Bainer & Didham, 1994, March-April; Bey & Holmes, 1992; Newton, 1994; Smith, 1993, Fall; Zetler & Spuhler, 1997).

The teaching and learning components, as well as the support components utilized in the state systemic change process mandated by the 1993 Educational Reform Act and disseminated throughout the state by the PALMS Initiative, were defined in the first two sections of operational definitions. The final section of operational definitions dealing with the systemic change components of the 1993 Educational Reform Act outlines the critical components of this legislative bill that directly impacted a change in the teaching practices of teachers within communities throughout the state.

1993 Reform Act Components Impacting Teachers to Change Teaching Practices

The Massachusetts Department of Education (DOE) and State Legislature passed the 1993 Education Reform Act to establish a comprehensive approach for raising student achievement and keeping students in school because they felt the present state educational system was not meeting the needs of today's society (French et al., 1990, February). This act completely reformed every aspect of the entire educational process within the state (Antonucci, 1995; Conference Committee Report, 1993, May; Finnegan, 1993). The areas of School Councils, Continuous Professional Development and Recertification, Massachusetts Curriculum Frameworks, Massachusetts Comprehensive Assessment System (MCAS), Time and Learning, and School Budgets are relevant to this research project, since they directly influenced a change in the teaching practice of teachers.

School Councils

School councils were composed of individuals representing school principals, teachers, parents, local legislators, businesses, colleges, museums, youth organizations, parent teacher organizations, and students at the secondary level. The purpose of the school council was to formulate an effective school mission statement and plan at each facility that helped all children in the school to develop to their fullest potential (Conference Committee Report, 1993, May; Finnegan, 1993). Teachers included on school councils began to work with the other members of the community to form a common shared purpose and vision that created a child-centered, nurturing school culture which enhanced academic learning. The vision emerged from the synergy, empowerment, and sense of ownership created through the active dialogue of this group of diverse individuals united in a common cause to improve learning (Covey 1989, 1990, 1995; Fullan, 1993, 1994, September; Fullan & Hargreaves, 1992; Fullan & Stiegebauer, 1991; Fullan et al., 1990, May; Fullan & Miles, 1992, June; O'Neil, 1995, April; Putnam, 1994; Senge, 1990).

Continuous Professional Development and Recertification

The Educational Reform Act provided state money for school districts to provide educators with continuous professional development opportunities to learn the latest research for teaching and learning practices that enhanced learning. A minimum of 120 hours of professional

development training was now required for educators to renew their primary certification every 5 years in order to remain employed in a school system. Sixty of the 120 hours of professional development points had to be in the content area of the educator's primary teaching certificate. If an educator had additional teaching certificates in other areas, the 1993 Massachusetts Education Reform Act required completion of 30 additional hours of professional development training in each of the specific certification areas being renewed (Commonwealth of Massachusetts Department of Education, 1994, September; Massachusetts Department of Education, 1997, October). This ongoing professional development allowed teachers to become effective change agents capable of fostering critical thinking, communication skills, and problem-solving strategies in students. Keeping current on the latest research also helped teachers to better prepare and equip students to become active, productive adult citizens capable of meeting the demands and challenges of the vastly different global society that will exist in the 21st century (Fullan, 1993; Fullan & Hargreaves, 1992; Showers & Joyce, 1996, March).

Curriculum Frameworks

The Curriculum Frameworks were the state curriculum guides which outlined the Massachusetts curriculum standards for important content, instruction, and assessment in each of the core subject areas K – 12. Each of the Curriculum Framework subject guides emphasized using a hands-on, inquiry-based cooperative learning approach that integrated learning across the curriculum, stressed the development of higher level critical thinking skills, real world problem-solving strategies, and effective communication skills (Massachusetts Department of Education, 1995, May-a).

Massachusetts Comprehensive Assessment System (MCAS)

The Massachusetts Comprehensive Assessment System is a student testing program conducted in grades 4, 8, and 10 to measure student performance in terms of the curriculum standards. The students' scores in schools and districts across the state were compared and measured with each other utilizing common standardized characteristics to evaluate similar systems.

Students in the 3rd and 7th grades across the entire state received MCAS in reading starting in the Spring of 2000. In addition to these tests, 5th graders in the Spring of 2000 received MCAS in science and technology plus history and social science, while 6th graders took MCAS in math. Graduating students must pass the 10th grade testing in order to receive their diploma by the year 2003 (Driscoll, 1999, June 1; Massachusetts Coalition for Higher Standards, 1998, Fall; Massachusetts Department of Education, 1997, April).

Teachers, schools, and districts are held accountable for the academic improvement of their students' performance. Students must demonstrate proficiency by passing this testing program. Low scores triggered a state investigation. The state placed any school or system found to be underperforming in their overall student performance on a remedial plan. After 2 years, if the school had not shown improvement, the state could take action based on their investigation that could result in the dismissal of teachers, the removal of the principal, and the school district being placed under state control through the state receivership program (Conference Committee Report, 1993, May; Finnegan, 1993).

Time and Learning

The Student Time and Learning Regulation of the 1993 Education Reform Act stated that the elementary schools' structured learning time must equal 900 hours, and secondary schools' structured learning time must equal 990 hours in the core subject areas. It also stated that a school district's year must be at least 185 days long, including at least 180 days of actual classroom operation for students (Massachusetts Department of Education, 1995, May-b). The emphasis on increased learning time in the state was correlated with educational research findings that pointed out a correlation between classroom time on task, teacher effectiveness, and positive classroom results (Riordan, 1997). Time and learning research also stressed the positive effect that "summer learning" had on overcoming the loss in cognitive development experienced by students from dysfunctional families and low socioeconomic status homes (Riordan, 1997).

The Time and Learning Regulation has had a profound impact on how teachers plan lessons and structure their daily teaching, especially at junior and senior high schools where school districts have moved to a system of block scheduling. The purpose of block scheduling was to provide flexibility within the school day in order to meet both the curriculum and student learning needs by allowing longer periods of time on task within the daily classroom structure.

With this new time frame, many high school daily class sessions within the state went from six 45-minute class periods to four 90-minute periods. This made the daily class schedule conducive for utilizing cross-disciplinary or interdisciplinary teams of teachers working with specific groups of students on in-depth thematic instructional units (Erb, 1997; Powell & Mills, 1994, November, 1995). This extended period allowed junior high and high school classroom teachers to implement an inquiry-based, cooperative learning, problem-solving curriculum approach to enhance student learning through self-directed group research projects. Students under this new time frame had classroom time to work on major thematic units of study that involved multiple disciplines, in-depth research, presentations and effective communication skills. This hands-on, inquiry-based cooperative learning approach incorporated the philosophical paradox into the classroom setting that "less was more" (Massachusetts Department of Education, 1995, May-b, 1997, April; PALMS, 1993; 1995, October).

School Budgets

Richard Rossmiller, in a paper presented at the International Intervisitation Programme in Educational Administration (Rossmiller, 1986, August), discussed the transition of equity in education from meaning equal access to schools, to meaning equal resources, to equally effective educational processes. The 1993 Massachusetts Education Reform Act assured that all three of these definitions. The Foundation Budget reform measures not only provided a statewide standardized per pupil funding foundation allocation system that followed the student, but it also created a statewide testing accountability system. This system of checks and balances was created to hold teachers, administrators, school systems, cities, and towns accountable for the way funds were spent on teaching and learning to assure that every student in the Commonwealth had an adequate educational opportunity in terms of per pupil expenditures and learning outcomes. The state created the extensive testing system to make sure funding revenues were spent on teaching and learning practices that provided students with an adequate educational opportunity in terms of basic knowledge and skills (Commonwealth of Massachusetts Department of Education, 1994, September; Conference Committee Report, 1993, May; Finnegan, 1993; Massachusetts Coalition for Higher Standards, 1998, Fall; Massachusetts Department of Education, 1997, April).

The previous definition sections have given a complete description of all aspects of systemic school change mandated by the 1993 Massachusetts Education Reform Act and disseminated throughout school systems in the state by the Project PALMS Initiative.

The PALMS approach embraces the educational goals of the Secretary's Commission on Achieving Necessary Skills (SCANS) (1991), Tucker (1992), Taskforce on Teaching as a Profession for the Carnegie Forum on Education and the Economy (1986) and the Commission on the Skills of the American Workforce (1990, June).

The Purpose of the Study

The purpose of this study was to identify the initial factor that allowed teachers to overcome their resistance to statewide educational reform as well as the factors that allowed teachers to move along the change continuum from non-utilization to routine utilization.

The first purpose was to discover the initial key factor — the original interest "hook" that allowed the teachers to make a paradigm shift in order for change to occur. Covey (1989, 1990, 1995), Senge (1990), and Senge, Kleiner, Roberts, Ross, and Smith (1994) discussed the important role a person's experiences and belief system played in this process.

The second major purpose of this study was to identify the factors or activities that transformed the teachers from a state of non-utilization to routine utilization of the PALMS hands-on, inquiry-based, cooperative learning approach.

Method

This study was one cycle of an ongoing 6-year action research project. This study was conducted 6 years after statewide implementation had begun in accordance with the statements made by Fullan and Stiegebauer (1991), Fullan (1993) and Harvey (1990), that the change process took 5 years or more for complex change to be implemented. Sixty-two participants in an urban area of Southeastern Massachusetts returned the survey, which contained a mixture of both qualitative and quantitative questions reflecting on the teacher's experiences as they participated in the change process, as well as the effects utilizing these reform measures had on the daily teaching and learning practices within their classrooms.

The Research Questions

Participants in this study were asked to answer a series of open-ended qualitative questions that corresponded to similar questions on the quantitative data section of the survey. This dual methodology was utilized as a cross-reference technique to verify the reliability and validity of the participant's responses. The questions on the participant's survey fell under the following main categorical research questions:

- What factors in training programs prompted teachers to use the innovation in their classrooms?
- What facilitated the teacher's initial paradigm shift in order to create an interest in implementing an educational innovation?
- What factors influenced teachers to utilize the innovation?
- What effect did implementing this innovation have on teaching and learning practices in teachers' classrooms?
- What were the concerns of teachers regarding the implementation of this innovation?
- What factors enhanced and/or inhibited teachers' utilization of this innovation?

Participants

Table 1 describes the background characteristics of the 62 teacher participants. Female teachers comprised 91.8% of the study. The majority of the teachers were Caucasian (93.9%), regular education classroom (65.6%) elementary teachers (85%) with a BS or BA degree (66.6%). The remaining teacher participants were junior high teachers (10%) and high school teachers (5%). The type of class and teacher's position responses further revealed that the teacher participant population also included inclusion classroom teachers (18%), special education classroom teachers (9.8%), bilingual education classroom teachers (4.9%), elementary permanent substitute teachers (4.8%), Title I teachers (1.6%), and teachers who service all types of classrooms (1.6%).

Table 1 here

Table 2 shows that the average age of the teacher participants was 47.78 years (SD=8.91), and that participants had an average of 21.61 years in the education profession (SD=10.5). Participants had taught an average of 21.50 years in Title I (SD=2.12), 19.62 years in regular education (SD=11.77), 16.92 years in special education (SD=7.45), 14.50 years in bilingual education (SD=10.21), and 4.84 years in inclusion (SD=5.95). The average class size of the teacher participants was 19.29 students (SD=4.59), and the average grade level was 3.67 (SD=2.67).

Table 2 here

The participants' open-ended responses were analyzed by categorizing common themes in the data. The quantitative statistical data responses were examined using the Statistical Package for Social Sciences to determine mean, standard deviation and percentile ranking. T-test and ANOVAs were run.

Results

The results of this study will be organized under the main categorical research questions that the participant's responses fell under when they responded to the individual questions on the research survey.

What factors in the training programs prompted teachers to use the innovation in their classrooms?

Table 3 reveals that 55 teachers (88.7%) participated in and rated the PALMS training; however, 4 teachers did not list the number of training hours taken. Seven (11.3%) of the 62 participants involved in this study had not participated in PALMS training. Fifty-one teacher participants (82.3%) out of the 62 teachers participating in this study have utilized PALMS. Forty-eight (94.1%) of the 51 utilizing teachers were trained, and 3 (5.9%) were untrained. Seven (12.7%) of the 55 trained teachers and 4 (57.1%) of the 7 untrained teachers did not utilize

PALMS. The untrained teachers simply followed the State Curriculum Framework subject guides developed as a result of the 1993 Education Reform Act that were sent to all teachers and school systems throughout the state.

Table 3 here

Table 4 lists the number of participant responses for each training factor that influenced teacher utilization of PALMS. The results of this study revealed five main factors that influenced whether or not the teacher participants used PALMS: "Approach Fit with Teachers Philosophy" - 20 responses; "Approach Good for Students" - 16 responses; "The Effectiveness of the Training" - 10 responses; the fact it was "Mandated" - 5 responses; and "More Training Needed" - 2 responses.

Under the category, "Approach Fits with Teacher Philosophy," the following training factors influenced teacher acceptance of PALMS (20 responses):

- PALMS encouraged utilization of higher level thinking skills and helped students to express their ideas, which teachers wanted.
- Teachers liked using different approaches to teaching; cooperative learning was non-competitive, and LINKS was an organized daily approach.
- The approach was enjoyable; exciting; high interest; creative; effective, appealed to all learning styles; was student centered; hands-on; utilized manipulatives; was project based; involved self-discovery; students constructed their own knowledge; it used real life experiences.
- The approach was similar to how the teacher taught, and it reflected the teaching nature of the subject matter. It was easy to implement.
- The approach utilized peer coaching.
- PALMS provided a different way of introducing lessons without textbooks, and it encompassed more than one curriculum area at a time. It was a thematic unit approach that did not depend on textbooks.

Under the category, "Approach Good for Students," the following training factors influenced teacher classroom application of PALMS (16 responses):

- PALMS involved students; students enjoy it; when students enjoy learning, they learn more; everyone gets a chance to contribute; children learn best by doing; students benefit from the hands-on approach; hands-on learning works well with students needing a multi-sensory approach; the hands-on approach has a high student interest; and the hands-on approach provides a tactile approach for learning.

- PALMS was a self-discovery approach; the concept stayed with the students; it kept all the students engaged in the lesson; students discussed what they had learned; it met the needs of students not successful in other avenues; it allowed students to construct their own meaning and understanding of concepts; it provided a great number of ideas that enriched curriculum; and active learning builds on students' interest and experiences.

- Group activities teach students socialization skills and responsibility.

Under the "Effectiveness of Training" category, the following training factors influenced teacher classroom adoption (10 responses):

- According to the data, teachers believed that the specific training in the various methods utilized in PALMS made learning fun. These methods included: hands-on learning, learning styles, cooperative learning, knowledge acquisition and construction, and inquiry-based learning. Methods were presented during training to make implementation easier.

- Teachers were encouraged to try new strategies like cooperative learning and thematic units. Graduate course work influenced teachers to take the time to prepare occasional lessons.

- Teachers liked the wealth of interesting and varied ideas presented to enrich the curriculum. Teachers enjoyed the training because it was fun, their input had value, and it was a non-threatening, hands-on group effort. The teachers enjoyed the activities and felt their students would, too.

- Free materials necessary to utilize approach were provided.

- Teacher and students were able to participate in training events.

Under the category of "Being mandated," the following training factors influenced teacher classroom employment of PALMS (5 responses):

- The nature of the course required utilizing this type of an approach (food lab).

- The PALMS approach initiated the changes mandated by the Education Reform Act of 1993.

- The state Comprehensive Assessment System (MCAS) was based on utilizing the PALMS approach.

Under the category of "More Training Needed," the following training factors must be employed before classroom application of PALMS could be instituted (2 responses):

- The teachers would like to or plan to use the approach with more training.

Table 4 here

Table 5 lists the factors affecting teachers' change in utilization of PALMS and the reasons for those changes. Fifty-four responses were given for reasons for change in utilization of PALMS since the last training session. Factors cited for "Increasing" the use of PALMS were:

- Teachers who used the approach felt the approach was good for their students. PALMS benefited the reluctant readers, as well as students with different learning styles. It optimized learning, and it increased student participation and understanding (Approach Good for Students - 4 responses).

- Teachers felt more secure and confident because of the new ideas for using this approach that they received during training sessions (Training - 3 responses).

- The 1993 Education Reform Act had mandated this curriculum approach (Approach Mandated - 3 responses).

- The approach fit with the teacher 's philosophy. The teacher liked to utilize new ideas, there was always room to improve teaching from new ideas, and the teacher did a lot of hands-on activities (Approach Fits Teachers Philosophy - 2 responses).

Teachers who had "Decreased" their use of PALMS since the last training session indicated that they did so for the following reasons:

- Teachers felt that more training, additional support sessions, and new ideas were needed (Need More Training - 4 responses).

- Teachers felt there was insufficient time to prepare and do the activities (Lack of Time - 3 responses).

- They believed that the approach was not effective for students because in their classes, students working in cooperative groups copied from student leaders, got silly, and distracted others who wanted to learn (Approach Not Good for Students - 2 responses).

- The approach did not fit with the teacher's philosophy. The teachers preferred to use *Activities Integrating Mathematics and Science* (AIMS) developed by the AIMS Education Foundation, or the teacher changed grade levels and felt it was not appropriate for the new grade level (Doesn't Fit Teacher's Philosophy - 2 responses).

- When supportive measures and teacher peer sharing strategies decreased, teachers got involved with other things and felt less secure in using PALMS (Lack of Support - 2 responses).

- The system was not supplying the necessary materials, and it was too expensive to personally supply the materials (High Cost of Materials - 1).

- Teachers had difficulty utilizing PALMS with large classes (Class Size Not Conducive to PALMS - 1 response).

Participant responses whose utilization remained the same fell into two categories, "Utilizing" and "Non-utilizing" the PALMS approach. Teachers whose "Utilization Remained the Same" cited the following reasons for using PALMS:

- The approach fit the teachers' philosophy, and the teachers were confident in utilizing it (Approach Fits Teacher's Philosophy - 4 responses).

- Teachers utilized the approach because training revealed the approach was effective (Effective Training - 1 response).

- Teachers utilizing PALMS believed that integrating the curriculum allowed time for this approach (Lack of Time - 1 response).

Teachers whose "Non-utilization Remained the Same" cited the following reasons for not using PALMS:

- Non-utilizing teachers felt there was insufficient time. They did not have enough time for hands-on activities and the state curriculum framework standards, reading and writing time demands had increased, and half-day kindergarten sessions did not allow enough time to accomplish all that was required. The teachers also felt they had insufficient planning time at school to adequately plan lessons utilizing this type of an approach, and that it was difficult to set up lessons within the subject matters' allotted time frame (Lack of Time - 6 responses).

- Non-utilizing teachers felt that the approach was not good for their students because the class was too large, the class was low academically, or the class was a self-contained special education classroom, which made utilizing the approach difficult. Some teachers no longer had their own classrooms. They were working with other teachers in an inclusive setting, so utilization depended on the classroom they were in

at the time or whether they were working with small groups of students using the Comprehensive Competencies Program (CCP), a remedial skills training program (Class Type and Size Not Conducive - 3 responses).

- Teachers were still not utilizing PALMS because they had not received PALMS training. Teachers not utilizing the approach felt the training did not coordinate with the state mandated curriculum frameworks (Training - 2 responses).

- The approach did not fit with the teacher's philosophy. The teacher liked the approach, but had changed grades and felt the approach was not appropriate at their new grade level. The teacher was more concerned with coordinating course content with the state curriculum frameworks (Doesn't Fit Teachers Philosophy - 2 responses).

- Teachers not using PALMS believed it was too difficult to utilize with the state mandated curriculum framework standards, and they were having trouble getting guest speakers to come into their classrooms (Approach Mandated - 1 response).

- The system was not supplying the necessary materials, and it was too expensive to personally supply the materials (High Cost of Materials - 1 response).

Table 5 here

Table 6 shows how the number of years teaching influenced training participation and PALMS utilization. Eight of the 13 teachers in the 1-10 years in teaching bracket averaged 29.13 hours of training. The 6 utilizing trained teachers in this bracket averaged 34.83 hours of PALMS training, in comparison to the 12-hour training average of the 2 non-utilizing teachers. Ten of the 11 teachers comprising the 11- 20 years in teaching bracket were trained. Nine of these teachers listed their training hours, for an average of 24.06 hours of training. The 8 trained utilizing teachers averaged 25.56 hours of training, while the one non-utilizing teacher who listed the hours of training had 12 hours of PALMS training. One non-utilizing teacher in this bracket rated the training experience, but did not list the number of training hours.

The 21 - 30 years in teaching bracket represented both the highest number of teachers utilizing PALMS and the teachers with the highest average of training hours. Two utilizing teachers in this bracket rated their PALMS training but did not list the number of PALMS training hours. The 21 trained utilizing teachers in this bracket who listed the number of PALMS training hours averaged 177.57 hours, in comparison with the 9.5-hour training average

of the 2 non-utilizing teachers. The 23 trained teachers in this bracket collectively averaged 162.96 training hours. The 11 teachers in the 31-40 years of teaching bracket averaged 60.70 training hours. The 10 trained utilizing teachers in this bracket averaged 60 hours of PALMS training, and the one non-utilizing teacher had also taken 68 training hours. One utilizing teacher who had taken PALMS training did not indicate the number of hours or the number of years teaching. These data disclosed that only one of the trained 7 teachers not utilizing PALMS had substantial training in the PALMS approach.

Table 6 here

Table 7 shows that teachers in the same 41-49 age bracket, who rated the effectiveness of PALMS the highest, was also the group with the highest number of participant requests for more training.

Table 7 here

What facilitated the teacher's initial paradigm shift in order to create an interest in implementing an educational innovation?

Table 8 displays the number of responses for factors that initially got teachers interested in the PALMS approach. The participants' comments disclosed that the following seven factors sparked their initial interest in the PALMS approach: Training - 20 responses; Approach Fits with Teacher's Philosophy - 11 responses; The Education Reform Act of 1993/Teacher Manuals - 11 responses; Approach Good for Students - 10 responses; Colleagues/Lead Teacher - 3 responses; Paid Training Sessions/Free Materials - 2 responses; Class Participating in Event Utilizing this Approach - 1 response.

"Training" was the first major categorical factor that hooked teachers' initial interest (20 responses). Teachers explained that:

- Training sessions, well presented and interesting, were factors that initially sparked teacher interest in utilizing PALMS. The fact that the organization presenting the training had a reputation for high quality training programs was also a factor.

- Course work explaining the PALMS approach sparked an interest to learn more. Project PALMS and the Buzzards Bay Rim Project (partner university grant providing funding for Education Reform teacher training) presented training sessions and courses conducted by the local university partnership training team which sparked the participating teacher's initial interest in this approach.

- The trainers encouraged and helped teachers to implement the approach. Workshops demonstrated ways the approach could be utilized. After attending training workshops, teachers realized the potential and benefits of this approach.

- Volunteers were asked to take science training, and teachers who liked science volunteered.

- An interest in science project ideas led to an initial awareness in the PALMS approach.

- Administrators introduced and suggested the approach.

The second factor sparking teachers' initial interest was the fact that the "Approach Fit with the Teacher's Philosophy" (11 responses). Here, teacher participants indicated:

- Initial interest was sparked because teachers liked to keep up with the latest teaching and learning classroom practices. Teachers liked trying new teaching and learning approaches, and if the approach worked, they continued utilizing it.

- The teachers enjoyed working with their hands. The teachers liked utilizing classroom learning centers.

- PALMS involved thematic units, and teachers could expand on the knowledge learned from previous lessons.

- The previous classroom experiences of the teachers dictated utilizing this approach.

- Teachers believed that PALMS took a multi-sensory learning approach a step further.

- The PALMS approach was a good way to organize and conduct science projects with students.

- Teachers believed that this was a good approach, and just felt there was a better way to teach.

- Teachers liked the fact that this approach developed thinking and reading skills.

- The way this approach broke down the skills needed for each subject area made it easier to write and follow Individual Educational Plans (IEPs).

The fact that the approach was "Mandated" by the state was another category sparking initial teacher interest (11 responses). Teachers explained that:

- The new teacher manuals utilized the strategies of this approach.
- Project PALMS was the first step explaining how to implement the Education Reform Act of 1993 curriculum mandates.
- The curriculum had changed, and to be effective, teachers had to use it.
- Getting information to study for teacher certification tests sparked an interest in learning more about this approach.
- The nature of the subject or course necessitated using this type of an approach (home economics - cooking).

The fourth factor that sparked initial interest in PALMS was the fact that teachers believed that the "Approach was Good for Students" (10 responses). Here, teachers acknowledged that:

- It was fun and exciting for both adults and students. It was fun and got away from just using the textbook. The approach maintained student interest. It was an attention grabber, and it motivated students.
- It was easy and effective. It helped students learn. Students grasped ideas more easily using a hands-on approach.
- The hands-on learning and an awareness of learning styles enhanced student learning.

The recommendation of "Colleagues or Lead Teachers" also sparked teachers' initial interest in PALMS (3 responses).

- Lead Teachers / Colleagues were doing many interesting things that worked with students, and they were enthusiastic about the results they were getting.

Another categorical factor involved having the teachers' initial interest sparked by the fact that they received some form of "Monetary Gain" such as (2 responses):

- Being paid to attend training sessions to learn about the approach.
- Receiving free manipulatives, classroom materials, or supplies for learning about the approach.

The last category sparking teacher interest in utilizing the PALMS approach involved "Attending Events" where the presenters, colleagues, or Lead Teachers modeled teaching the approach to the class (1 response). This was done through:

- The classroom participating in an event or school-wide function that utilized this approach.

Table 8 here

The factors sparking the teachers' initial interest in learning about the PALMS approach have been listed, based on the teachers' qualitative responses in this section. This study also addressed the factors that influenced teacher attitudes in adopting and continuing to utilize PALMS.

What factors influenced teachers to utilize the innovation?

Table 9 lists the quantitative factors that the participants checked off as influencing their utilization of PALMS. All factors were based on 59 participant responses. The most frequently mentioned factor was "PALMS Training Sessions," where 43 participants (72.9%) listed this as an important factor influencing their attitude toward utilizing PALMS. The 2nd highest factor, with 28 participants (47.5%) listing it as important, was "The Class Participating in an Event" such as "PALMS Extravaganza in Math and Science, "Hands-on Math and Science Fairs," and "Hands-on University or Museum Partnership Inquiry Center Based Field Trips Events." The 3rd highest factor, with 23 participants (39%) stating this influenced their utilization, was "The Educational Reform Act of 1993."

The next five factors all had a similar rank in terms of their influence on implementation of PALMS: "Family Math and Science Nights" - 15 participants (25.4%); "Massachusetts Comprehensive Assessment System" (MCAS) - 15 participants (25.4%); "PALMS Specialist" - 14 participants (23.7%); "Colleague" - 14 participants (23.7%); "PALMS Lead Teacher" - 13 participants (22%). The next level of influential factors listed the "Building Administrator" - 10 participants (16.9%). The next three responses can be grouped again because of their similar ranking status: "Ongoing Support" - 8 participants (13.6%); "Peer Coaching" - 7 participants (11.9%); and "Central Administration" - 6 participants (10.2%). Participants in this study were mostly veteran teachers (see Table 2 & Table 16); consequently, very few new teachers needing

mentors responded to this survey. Four participants (6.8%) listed "Receiving Mentoring Assistance" as a factor. Four participants (6.8%) wrote in an answer for "Other." The influencing factors represented under "Other" (Appendix) were:

- Textbook changes
- My own belief that this was a good approach
- There was no other option because the course (home economics) must be taught this way.
- It worked—have always tried new approaches and utilized what worked.

Since each influencing factor was based on the responses of 59 participants checking off the important factors affecting their adoption of PALMS consequently, the data also revealed the following non-influencing results: "Ongoing Support" - 51 participants (86.4%); "Building Administration" - 49 participants (83.1%); PALMS Lead Teacher - 46 participants (78%); Colleague - 45 participants (76.5%); PALMS Specialist - 45 participants (76.3); MCAS - 44 participants (74.6%); Family Math and Science Nights - 44 participants (74.6%); Education Reform Act - 36 participants (61%); Your Class Participating in an Event - 31 participants (52.5%); and PALMS Training Sessions - 16 participants (27.1%). Please note that ranking non-influencing factors in order from most to least necessitates reading Table 20 from the bottom up.

Table 9 here

The paired samples t-tests for factors influencing utilization in Table 10 show the following significant points about the factors mentioned above and their influence on teacher utilization. The teachers who used PALMS because of the Education Reform Act of 1993 ranked the quality of the PALMS training lower ($t = 2.86$; $p = .006$). Teachers who said that the Education Reform Act of 1993 was the reason they utilized PALMS tended to use an integrated, across-the-curriculum approach less than those for whom the Education Reform Act of 1993 was not a factor ($t = 2.49$, $p = .016$). Teachers who indicated that training influenced their decision to utilize PALMS rated the effectiveness of the training quality higher ($t = 2.28$, $p = .027$).

Teachers who stated that colleagues influenced their decision to adopt PALMS had taught fewer years ($t = 2.33$, $p = .023$) and had less years in regular education ($t = 2.97$, .005). This

shows that colleagues had more influence over new teachers utilizing PALMS. Teachers who said that peer coaching was an important factor influencing their utilization of PALMS ranked the effectiveness of the PALMS approach lower ($t = 2.19$, $p = .034$), taught at a lower grade ($t = 2.93$, $p = .14$), and had fewer students in their class ($p = 2.54$, $p = .014$). Teachers who stated that receiving mentoring assistance was an influencing factor in utilizing PALMS had taught fewer years ($t = 8.64$, .001) and utilized the PALMS approach less in social studies ($t = 3.16$, $p = .006$). Teachers stating that the central administration was a factor influencing their PALMS utilization ranked the overall effectiveness of PALMS lower ($t = 2.95$, $p = .005$), and the student enjoyment of PALMS lower ($t = 2.31$, .026) than the teachers for whom central administration was not a factor. When the central administration was the influencing utilizing factor, teachers also used the approach less in social studies ($t = 3.10$, $p = .004$) and science ($t = 2.36$, $p = .038$).

The data affirmed that teachers scored the effectiveness of PALMS lower when they felt they were being forced to utilize the PALMS approach by both the state in terms of the Education Reform of 1993 and by the central administration of their school system. The results also acknowledged that teachers who listed building administration as an important influence over their decision to use PALMS taught in the lower grades ($t = 2.94$, $p = .006$). Younger teachers felt more insecure utilizing PALMS and wanted ongoing support ($t = 2.03$, $p = .048$). Teachers who listed ongoing support as a factor utilized PALMS less in reading ($t = 2.76$, $p = .010$) and social studies ($t = 3.10$, $p = .004$). When MCAS testing was listed as a factor influencing utilization, teachers ranked the quality of the training lower ($t = 2.10$, $p = .041$) and utilized the approach less in science ($t = 2.93$, .005).

Table 10 here

Table 11 reports the crosstabs results for use of PALMS, revealing that teacher utilization of PALMS was not significantly influenced by the teacher's gender, degree status, years in teaching profession, age, school level, or type of class. The data revealed that 60% of all males who responded used PALMS, while 40% did not. Out of the 45 female participants who responded, 83.3% utilized PALMS and 16.7% did not. The difference between male and female utilization was not significant ($X^2 = 1.64$, $p = .23$).

The data from this study also showed that the degree level of responding teachers was not a significant factor affecting teachers (X^2 = .32, p = .731). The data indicated that out of the responding teachers with BA/BS degrees, 30 teachers representing 78% of the participants utilized PALMS, while 8 teachers with BA/BS degrees representing 21% did not. Seventeen teachers (85.0%) with MA/MS degrees utilized PALMS, while 3 teachers with MA/MS degrees (15.0%) did not.

The data also showed that the career stage of responding teachers was not a significant factor influencing utilization. Under the 0 - 10 years in teaching category, 7 teachers representing 58.3% utilized PALMS, while 5 teachers (41.7%) did not. In the 11 - 20 years of teaching category, 9 teachers (81.8%) utilized PALMS, and 2 teachers (18.2%) did not. In the 21 - 30 years in teaching bracket, 22 of the responding teachers utilized PALMS, while 3 did not. The last bracket, representing teachers with 31 - 40 years in teaching, indicated that 9 teachers (91.3 %) utilized PALMS, while 2 teachers (8.7%) did not. There were no significant differences found between these career stages for utilizing and non-utilizing teachers (X^2 = 5.34, p = .15).

Age was also found not to be a factor that significantly influenced the responding teachers to utilize the PALMS approach. In the 28 - 40 age bracket, 6 teachers (66.7%) utilized PALMS, and 3 teachers (33.3%) did not. The 41 - 49 age bracket had 13 teachers (76.5%) who utilized PALMS and 4 teachers (23.5%) who did not. In the 51 - 65 age bracket, 21 teachers (91.3%) utilized PALMS, while 2 participating teachers (8.7%) within this age bracket did not. The difference between teachers who utilized PALMS and did not utilize PALMS affirmed that age was not a significant factor influencing teachers' utilization of the PALMS approach (X^2 = 3.08, p = .214).

School level was not a significant factor influencing teachers' utilization of PALMS. Forty-one of the responding teachers (83.7%) at the elementary level utilized PALMS, while 8 (16.3%) did not. The junior high level had 4 responding teachers (66.7%) who utilized PALMS and 2 teachers (33.2%) who did not. The high school level had one responding teacher (50%) who utilized PALMS and one teacher (50%) who did not. There was no significant difference between the teachers who utilized PALMS and teachers who did not utilize PALMS by school level (X^2 = 2.25, p = .325).

The data also affirmed that the type of class that teachers had did not influence the teachers' utilization of PALMS. Thirty-three of the regular education teachers (84.6%) responding

utilized PALMS, while 6 (15.4%) did not. Four special education teachers (66.7%) responding utilized PALMS, while 2 (33.3%) did not. Seven inclusion teachers (70%) responding utilized PALMS, and 3 (30.0%) did not. Both responding bilingual teachers utilized PALMS (100%) and the only teacher specialist working with all types of classes who responded utilized PALMS (100%). There were no significant differences between teachers who utilized or did not utilize PALMS by classroom type (X^2 =2.63, p .622).

Table 11 here

What effect did implementing this innovation have on teaching and learning practices in teachers' claccrooms?

Table 12 shows a significant difference in the results of the ANOVAs for School Level by perceived change in classroom teaching and learning components from the summed difference of the after PALMS use scores minus the before scores. The two junior high respondents averaged the highest change in teaching and learning components, while the three teachers at the high school had the lowest (F = 4.12, p = .023). The average change of the two junior high teachers was 36.50 (SD = 12.02), while the average change for the three high school teachers was 6.67 (SD = 9.07), and the average change for the 45 elementary teachers was 28.80 (SD = 13.87). The data suggest that the change agent target junior high school teachers and high school teachers for further training.

Table 12 here

Table 13 provides the results of ANOVAs for the effectiveness ranking of the PALMS approach by teaching level, based on a 5-point scale. Forty-one elementary teachers rated the overall effectiveness of PALMS at 3.85 (SD=.65), 3 junior high teachers rated the effectiveness at 5.00 (SD.00), and 2 high school teachers rated the effectiveness at 3.00 (SD.00). The junior high teachers, though few in number, rated PALMS the highest, while the high school teachers, also few in number, rated it the lowest (F=6.70, p=.003). These data provide the change agents with information about the effectiveness of this approach at the various teaching levels and suggest further training for junior high and high school teachers.

Table 13 here

Table 14 shows how teachers perceived that students liked PALMS by teaching levels, based on a 5-point scale. Teachers reported that students at elementary, junior high, and high school enjoyed using the PALMS approach for learning. Forty-one elementary teachers ranked the average student enjoyment of this learning approach at 4.24 (SD=.66), 4 junior high teachers rated the average student enjoyment at 4.00 (SD=2.00), and 2 high school teachers rated the average student enjoyment at 3.50 (SD=.71). There was no significant difference between the three levels (F=.89, p=.42). Teachers indicated that their students at every level of teaching enjoyed utilizing the PALMS approach for learning.

Table 14 here

Table 15 provides the results of the ANOVAs for the effectiveness ranking of the PALMS approach by age. Significant differences were found in the effectiveness rating of PALMS among teachers of different ages. Twelve teachers from 41-49 years old rated the PALMS approach the highest, and the 6 youngest teachers ranging in age from 28-40 years old rated it the lowest (F=4.65, p=.016). The average rating of the 12 teachers in the 41-49 age bracket was 4.33 (SD=.49), based on a 5-point scale. The average for 21 teachers in the 51-65 age bracket was 3.76 (SD=.70), compared with the 6 younger teachers (aged 28 to 40) who had an average of 3.50 (SD=.55) on a 5-point scale.

Table 15 here

What were the concerns of teachers regarding the implementation of this innovation?

Table 16 lists the positive participant responses to the question: What are your concerns regarding this approach? The concerns teachers expressed regarding PALMS utilization were categorized into two sections. The positive concerns suggested that the approach was effective, and the negative concerns suggested the approach was not effective. The five main positive

concerns included: "Time and Resources" - 26 responses; "Training" - 8 responses; "Class" - 8 responses; "Curriculum" - 7 responses; and "The Approach is Good for Children" - 2 responses.

Under the first category of the Positive Responses, "Time and Resources," the participants' responses addressed the following concerns (26 responses):

- Teachers had a pressured time schedule, and the hands-on, inquiry-based cooperative lessons involved in the PALMS approach required additional lesson time for passing out and collecting materials, conducting group activities, and sharing group results with the entire class (Time - 10 responses).

- The PALMS approach required additional time to plan the various lesson activities, collect, organize, and prepare all the materials needed to conduct all the hands-on group activities (Preparation - 4 responses).

- The school system needed to provide teachers with a funding source to cover the cost of the materials that teachers had to purchase to conduct the hands-on, inquiry-based cooperative lessons in their classrooms (Cost - 4 responses).

- Teachers needed additional classroom space for the group activities and large charts. Teachers also needed more storage space for the extra equipment and materials necessary for the hands-on, inquiry-based cooperative lesson activities (Resource Space - 2 responses).

- The school system needed to provide all the materials needed to conduct hands-on, inquiry-based cooperative classroom lessons (Resources - 4 responses).

- Teachers needed more parental involvement to help in the classroom while conducting the hands-on, inquiry-based cooperative lessons utilized in the PALMS approach (Class Help - 4 responses).

The second positive concern area addressed by teachers involved "Training" (8 responses).

- Teachers wanted separate grade-level training sessions. Teachers felt the training sessions had become less frequent and harder to access (Training - 4 responses).

- Teachers wanted group support workshop sessions that addressed the approach from a whole perspective instead of just as isolated activities. Teachers were concerned that utilization was decreasing due to lack of training and support sessions. Teachers were concerned that the lack of cooperation and support meant that the approach was no longer important to the central administration, since the Lead Teachers and PALMS Specialists were not available to assist with classroom demonstrations or training. Teachers were concerned that the approach would end up like past educational innovations: Here today and gone tomorrow (Support - 3 responses).

- Teachers were concerned that their scientific background knowledge was inadequate. Teachers wanted to make sure their facts and conclusions were correct (Background Knowledge - 1 response).

The next category of concern dealt with "Class Type, Size and Management Issues" (8 responses).

- Some students were not able to work as part of the team because they required a great deal of structure to enhance their learning process. Teachers were concerned with the fact that some classes were very hyperactive. Teachers were also concerned that students using this approach became noisy and chaotic at the lower levels (Class Type - 2 responses).

- Some teachers felt that the class size made a difference in utilizing the approach in terms of management issues, supplies, and available space (Class Size - 2 responses).

- Class management issues dealing with controlling the learning experience and behavior concerned teachers. Keeping the class reasonably quiet and on task was an issue of concern when utilizing this approach (Management Issues - 4 responses).

The next category area dealt with "Curriculum" concerns (7 responses).

- Some teachers were concerned about whether or not the approach was applicable to the content and subject matter of their class (State Curriculum Framework Standards - 2 responses).

- Teachers were also concerned that the need for better MCAS test scores would cause "drill and kill" strategies to return (State Comprehensive Testing - 3 responses).

- Teachers were concerned with relating this approach to the state curriculum standards required and meeting the grading accountability factor for MCAS assessment scores (Assessment and Grading Accountability - 2 responses).

The next positive category addressed the fact that this "Approach Was Good For Children" (2 responses).

- One teacher reported that this approach benefited students with Attention Deficit Disorder (ADD).

- One teacher communicated that this approach was both challenging and rewarding for inner-city school students.

The last positive category contained concerns involving how the "Approach Fit With the Teacher's Philosophy" (2 responses). Under this category, two teachers commented that:

- They liked utilizing PALMS. Thematic units, hands-on cooperative learning, and inquiry-based learning were highly effective teaching methods.

Table 16 here

What factors enhanced and/or inhibited teacher' utilization of this innovation?

Factors Enhancing Utilizing PALMS

Table 17 lists the number of responses from most to least for each factor enhancing utilizing the PALMS approach. The results of this study revealed four main factors enhancing teachers utilizing the PALMS approach: "Approach Good for Students" - 50 responses; "Training /Support / Provided Materials / Class Event or Demonstration" - 9 responses; "Approach Fits Teacher's Philosophy" - 5 responses; and "Class Type / Class Size / Class Management" - 3 responses.

The following reasons were listed as enhancement factors under the category, "Approach Good for Students" (50 responses):

- This approach motivated student interest in the subject area, and encouraged self-initiated exploration. It was fun, and students liked it. They liked the hands-on and cooperative learning approach. It held the student's attention on the lesson and kept the student focused on the task at hand. It increased class participation and decreased discipline problems. The science kits and math manipulatives were great for hands-on learning. Students learn by doing.

- It increased socialization skills, peer coaching, and academic achievement. It was non-competitive. Everyone was successful. It taught the students to work together and learn from one another. It fostered teamwork, and the students enjoyed working together and sharing ideas. The teacher became the facilitator who empowered students, monitored and observed rather than always directing the lesson. The PALMS approach used cooperative learning to the greatest extent. Students worked together better. The students developed their own strengths and helped each other. Student leaders emerged. The student's work had value.

- This approach helped build student understanding and knowledge, and it enhanced student learning outcomes. By having students answer "why" and "how" questions, they developed a clearer understanding of the objective. Team teaching / peer coaching and working with a partner allowed students to get 100% of the lesson. Graphic organizers helped students understand the lesson and gave students a model to follow for compositions, making writing easier.

- This approach directed and developed higher level critical thinking skills. This approach, by allowing students to estimate and then figure out the answer or actual amount, allowed the students to feel safe about their thinking and reasoning skills. Student interaction fostered science, math, reading, and problem solving.

- This approach developed better communication. It enabled students to develop and enhance their verbalization and writing skills. This approach used literature as a springboard to motivate interest and introduce the unit or lesson.

- This approach accommodated all learning styles and ability levels. It appealed to tactile learners. They found it fun to touch things. It utilized their modality of learning. The hands-on approach also helped the visual learners in all areas: spelling, language arts, phonics, math, science, and reading.

The next category included factors of "Training," "Support," "Providing Materials," "Class Events" and/or "Demonstrations" (9 responses). Under this category, teachers commented about how:

- Grant money provided training, equipment, and materials for teachers to utilize the PALMS approach.

- The PALMS partnership training teams from the local university and museum were helpful, provided support, and made utilizing PALMS go smoothly.

- The Lead Teachers and the PALMS Specialist gave classroom demonstrations utilizing the PALMS approach with teachers and their students. They also gave training workshops where teachers became the students and worked on thematic unit activities utilizing the PALMS approach.

- The central administration office and PALMS Lead Teachers made supplies and resources available for classroom lessons.

- The AIMS workshops were active, hands-on training sessions where the leaders had teachers participate as students utilizing hands-on lessons in a thematic unit format.

- Course work strongly encouraged and emphasized the importance of using PALMS, as well as providing many illustrations of situations where PALMS was effective. Course work emphasized how utilizing PALMS prepared students for MCAS testing.

The third category under factors enhancing utilizing PALMS dealt with how the "Approach Fit the Teacher's Philosophy"(5 responses). Here, the teachers commented on how:

- The PALMS approach was holistic and allowed a broad area of subject matter to be covered within a limited time frame by integrating all areas of the curriculum. This approach provided the reason for everything.
- It was enjoyable to utilize learning centers.
- This was the only approach the teacher had utilized.

In the last category of factors enhancing utilizing PALMS, "Class type," "Class Size," and "Classroom Management" comments were grouped together (3 responses). Here, teachers commented on how:

- The age of the students enhanced utilizing PALMS.
- Small classes enhanced utilizing PALMS.
- Inclusion classrooms enabled teachers to utilize cooperative learning.

Table 17 here

Factors Inhibiting Utilizing PALMS

The factors inhibiting utilizing PALMS fell into the six main categories listed in Table 18: "Lack of Time" - 10 responses / "Increased Preparation" - 9 responses; "Lack of Resources" - 12 responses / "High Cost of Materials" - 2 responses / "Need for Space" - 1 response; "Class Type Not Conducive to Using PALMS" - 2 responses / "Class Size Not Conducive to Using PALMS" - 6 responses / "Class Management Problems Using PALMS" - 7 responses; "Subject Content Not Conducive to Using PALMS" - 6 responses / "Alignment with Curriculum Frameworks" - 1 response / "Preparation for State Testing (MCAS)" - 1 response / "Adequate Assessments" - 1 response; "Lack of Training" - 3 responses / "Lack of Support" - 3 responses; and the "Approach Doesn't Fit with Teachers Philosophy" - 4 responses.

Teachers listed 19 responses under the first category, "Lack of Time," for not utilizing PALMS:

- This approach takes a lot more time, management strategies, and reflection. Teachers did not have adequate time to research a topic, find resources and materials, prepare unit plans, set up lessons, and pass out materials for this type of an approach. Blocks

of uninterrupted time to integrate a project fully are missing. There are too many subjects to teach to find time to develop lessons required for curriculum frameworks.

- The PALMS approach takes too much time, and teachers needed an assistant.

- There was not enough time to complete all that needed to be done in half-day kindergarten sessions.

- The "Won Way" reading approach used by teachers limited the time for utilizing PALMS because it was a highly structured, time consuming, phonetic approach.

Under the second category, teachers listed 16 inhibiting reasons for not utilizing the PALMS approach involving problems with the class type, class size, and classroom management.

- The approach caused a problem for the students who preferred to work alone or had difficulty working with their peers. Some students sat back in the group and let others do all the work.

- Adjusting cooperative teams to accommodate all the various personalities in the classroom was a problem. Classroom behavior problems made utilizing this approach difficult. Extremely difficult classes that were too competitive and too talkative also made utilizing this approach difficult. Most lessons were 90% discipline and 10% teaching. Manipulatives were distracting and toy-like, and allowing students to have some time for free play using the manipulatives before starting the lesson helped. This approach was noisy and disturbed others.

- The age and number of students in the classroom affected utilizing this approach. Twenty-five to 30 students for one teacher inhibited the full exploration of interrelated topics. Classrooms operated best with 16 students or less.

- Teaching special education prevented the teacher from utilizing cooperative groups.

Under the third category, teachers cited 15 responses that inhibited utilizing PALMS based on the lack of resources, the cost factor involved, and the need for more classroom space.

- Teachers lacked the manipulatives, materials, supplies, and resources to utilize the PALMS approach in their classroom. Teachers had a problem finding materials and lesson ideas to fit this approach. The school did not have books available to enhance interest and understanding. The school did not supply the materials, and teachers had to pay for them out of their own pockets if they utilized this approach. Teachers could not afford to pay for the needed materials themselves.

- Large classes required so many desks in the room that there was not enough space available to do the hands-on activities.

- The school system used basal tests. Between the required curriculum frameworks and the required texts, it was too difficult to do the PALMS approach.

Under the category area "Subject Content, Curriculum Frameworks, MCAS and Assessment," teachers listed eight responses that inhibited utilizing PALMS.

- Utilizing only this approach created a problem getting concrete marks for grading. Standford Achievement Tests (SAT) and MCAS exams did not test this approach adequately.

- Teachers did not feel confident with their background information in the area of scientific knowledge. Students lacked basic general knowledge. Teachers had to align their lessons with the state curriculum frameworks and make significant progress covering the specified topics. Teachers were concerned with the applicability of the PALMS approach to the subject matter. There were skills taught and tested at each grade level that could not be taught utilizing this approach.

Teachers listed six responses under the category of "Lack of Training and Support" that inhibited utilizing this approach.

- Teachers lacked training for this approach. Teachers needed more training to feel comfortable utilizing this approach.

- Teachers did not receive the support they needed for using this approach.

- Teachers needed classroom assistance to help with lessons when utilizing this approach.

The last area, "Approach Doesn't Fit with Teachers Philosophy," contained four responses that inhibited using this approach. Here, teachers commented that:

- The approach stifled individual teacher creativity.

- The approach could not be utilized all day. The students were not learning enough because teachers were not directly involved.

- Using just one approach made teaching and learning too narrow and stifled the free flow of ideas.

Table 18 here

Table 19 lists the factors and the number of responses influencing the non-utilization of PALMS. Teachers not planning to utilize PALMS listed the following reasons for non-utilization:

- Training insufficient at present time. Insufficient information for grade level requirements (Need for More Training - 3 responses).
- Teacher utilized AIMS instead (Use AIMS instead - 1 response).
- Approach not applicable to their teaching subject matter (i.e. reading/language teacher utilizing specific methodologies) (Not applicable - Teaching Specific Program Methodologies - 1 response).
- Not enough preparation or class time (Lack of Time - 1 response).
- Classroom management problems, the class was too noisy and chaotic. The students did not obtain their highest level of performance (Students lack Understanding - 1 response).
- Students were having difficulty making connections using this approach (Students Don't Understand - 1 response).
- Teachers who were not utilizing PALMS at the present time said they would utilize it during 2nd semester (Use Later: Not Applicable 1st Semester - 1 response).

Table 19 here

Summary of Findings

Training Program Factors Influencing Teacher Utilization

The quantitative data indicated training as the strongest influence affecting the teachers' attitude toward utilizing the approach. The data suggested that the teacher population the change agent needed to target in this system for further training was junior high and high school teachers. The data also revealed that teachers desired further curriculum training in methods, materials and ideas by grade level and subject area, as well as classroom management ideas.

According to the qualitative data, the approach being mandated affected the teachers' initial interest in finding out about the approach and their decision to take training, but the fact that it was mandated was not reason enough alone for the teachers to utilize the approach. The major

factors influencing PALMS utilization brought out by study participants in the qualitative data were the importance of quality training.

Factors Influencing Initial Pardgim Shift

The above data indicated that the initial factors that attracted the teacher's interest in learning about the innovation were training, the approach fitting with the teachers philosophy, the fact that the approach was mandate by the state and their school system, the fact that the approach was utilized in their teachers editions, a colleague or lead teacher was utilizing the approach, they were paid to attend training sessions or given free materials for attending, or their class participated in an event using this approach.

Factors Influenicng Teacher Utilization

The data indicated that the factors that influenced teacher utilization of PALMS methods were PALMS training sessions, their class participating in an event, the Educational Reform Act of 1993, Family Math and Science Nights, the Massachusetts Comprehensive Assessment System (MCAS), which was state mandated testing in 4^{th}, 5^{th}, 8^{th} and 10^{th} grade was based on this approach, PALMS specialist, colleagues, PALMS lead teachers, building administrators, ongoing support, peer coaching, central administration, and mentoring.

The quantitative data indicated that the class participating in an event utilizing the approach was the second strongest influence, and the Education Reform Act was the third strongest influence. Family Math and Science Nights, state testing, trained specialists, and utilizing colleagues were influencing factors all basically having the same effect on the teachers' attitudes toward utilization. The qualitative data revealed the fact that the approach strategies must be good for students, and that the strategies needed to fit with the teacher's personal philosophy of education. Support and the approach being mandated were mentioned less frequently as factors influencing participating teachers to use PALMS.

Implementation Effects on Teaching and Learning

The quantitative data revealed that teachers believed that the approach took more time planning and increased the amount of materials, resources, and time needed to conduct lessons,

but it had significant positive learning outcomes in all the listed areas affecting student growth. Utilizing the PALMS approach allowed teachers more time to observe and help students with their individual learning needs in order to maximize their students' ability to develop to their fullest learning potential. Data analysis also revealed that when teachers felt they were pressured into utilizing the approach, they rated both the overall effectiveness of the approach and how the students liked the approach lower.

Teacher Implementation Concerns

The data revealed that having enough time and resources was the largest implementation concern expressed by the teacher participants. Other factors concerning teachers implementing this approach involved additional time, teacher support, curriculum alignment with state testing, assessment accountability, and class management issues.

Factors Enhancing Utilization

The major factor enhancing teacher utilization was the fact that the approach was good for students. The qualitative data revealed that teachers felt it was motivational, fun, students liked it and it held their attention. The data further indicated that teachers felt their students were successful. Other factors mentioned as enhancing utilizing were the approach was a non-competitive approach that accommodated all learning styles, utilized graphic organizers, effective communication and study skills to develop critical thinking and problem solving strategies that allowed students to be successful.

Factors Inhibiting Utilization

The factors that inhibited participating teachers from adopting or utilizing the educational reform strategies were lack of time, increased preparation, class size and type, class management problems, lack of resources, cost of materials, classroom space, lack of training, lack of support, approach did not fit with teachers philosophy, it was not conducive with the subject area taught, it did not align with the curriculum frameworks, lack of adequate assessments, and preparation for state testing.

Discussion

In order to promote school renewal through change agent strategies it is critical that teachers understand, embrace, and welcome change. This study guided by the research of Fullan and Stiegebauer (1991), Fullan (1993), and Harvey (1990), stating that the change process took 5 years or more for complex change to be implemented, this researcher waited until now to fully examine the teachers' change experiences. Fullan and Stiegebauer (1991) found that teachers needed to experience an innovation or change before they could develop meaning, an operational understanding, or could make a judgment about the innovation or change.

Taking Charge of Change (Hord, Rutherford, Huling-Austin, & Hall, 1987) described the steps in the change process necessary before implementation of an innovation could be achieved. The steps involved initial information, interest, preparation, early use, and routine use (Hall et al., 1980; Hord et al., 1987). Data from this study compared with Hall's research supplied the answer for what it took to move teachers from the information stage in the change process to routine use of the teaching practices.

A number of authors dealt with the various aspects or factors that related to and influenced the multi-faceted, complex process involved in teachers moving successfully through the change process and achieving routine use of an innovation. This study contributes to the staff development literature on creating organizational change in schools (Argyris, 1993; 1993, Winter; Argyris & Schon, 1974; 1978; Barth, 1988, 1990; Bennis, Beane & Chin, 1985; Blanchard & Johnson, 1986; Blanchard & Lober, 1984; Costa & Garmston, 1994; Crandall & Loucks, 1983; Evans, 1993; Fessler & Christensen, 1992; Fullan, 1982, 1990, 1993, 1993b, 1994, September; Fullan, Bennett & Rolheiser-Bennett 1990, May; Fullan & Stiegebauer, 1991, Fullan & Hargreaves, 1992; Fullan & Miles, 1992, June; Garmston & Wellman, 1995, April; Glickman, 1990, Septmember; Guskey, 1986; Hall, George, Griffin, Hord, Loucks, Melle, Metzdorf, Pratt, & Winters, 1980; Hall & Hord, 1987; Harvey, 1990; Kanter, Stein & Jick 1992; Kirkpatrick, 1985; Larson, 1992; Mahler, 1996, December; Rogers, 1995; Senge, 1990; Sparks, 1988. Each of these authors dealt with different facets of the change process. This section of the paper will relate, compare and contrast their findings to the results of this study.

The Teacher's Role in the Change Process

This study, like numerous previous studies revealed the important role that the teacher holds in the educational change process. Glickman (1990, September) insisted that the issue of the teacher's role in school must be addressed for any changes to be sustained. Glickman (1990, September) felt that the information given teachers through professional empowerment by shared responsibility in managing the school would create a synergy that enabled the teachers to work smarter and harder for the benefit of their clients (students, parents, and society).

Mink (1968) and Tracey (1993, May) stressed the importance of the teachers being the central focus of educational change and school improvement practices since teachers really head the school. Maeroff's (1988) stated, "The teacher is the basis of schools" (p. xiii). Parkay (1976) and Tracey (1993, May) reminded us that before schools actually implemented educational change and improved, the teachers, in the final analysis, had to be and were ultimately the ones who made the decision to change the teaching and learning practices inside their own classrooms. Classroom teachers are the most important factor in the school system, and to be successful in their primary position, the rest of the system must support them (Supranovich, 1980, September; Tracey, 1993, May). Barth (1988b) discussed the school as a community of leaders and stressed the importance of teachers as leaders by explaining, "Research suggests that the greater the participation in decision-making, the greater the productivity, job satisfaction and organizational commitment" (p. 34). Alexander (1967), Trump (1967), and Tracey (1993, May) expressed the fact that for students to achieve a relevant, quality education, teachers needed to adopt new roles and current educational innovative practices. This is why as a change agent promoting school renewal it is critical to understand the factors that not only hook the teacher's initial interest in educational reform and new classroom strategies for teaching and learning but support teachers in their movement along the change continuum from non-utilization to routine utilization.

Initial Implementation Interest Factors Creating the Teachers' Paradigm Shift

Paid Training Sessions/Free Materials

The paid training sessions and free materials listed by participants as factors influencing their initial interest in the PALMS approach promoting utilization of the Education Reform Act of

1993 mandated curriculum supports Larson's (1992) research that using rewards to induce change fits with the concept of creating self-renewing schools.

Mandated Approach

The fact that the approach was mandated affected initial interest and training more than utilization. This finding agrees with Fullan (1993), Hall et al (1980), Hall & Hord (1987) that change is a process that takes time, and implementation did not take place simply because it was mandated. It also agreed with the research literature that described mandates as necessary sometimes for stimulating change (Fullan & Stiegebauer, 1991; Loucks-Horsley & Roody, 1990 May/June) or the original blueprints that initiated the innovation into motion (Bardach, 1977). But this study found, like Fullan (1982) that the mandated policy alone did not bring about successful educational change.

Bennis, Benne, and Chin (1985) revealed that even though mandated change carried political power which gave legitimacy to the change by allowing sanctions to be imposed on implementation resistance, it was still not enough to bring about the desired change alone. Bennis et al. (1985) found that the new conduct of participants implementing the change depended on a change in the participants' knowledge, skills, attitudes, beliefs, and values, which required a process of reeducation. The new conduct also resulted in a change in the norms, roles, and relationships within the learning organization.

Factors Influencing Teacher Utilization

This study found that the major factors influencing teachers' utilization of PALMS were the importance of training, the approach strategies needed to be good for students, and strategies needed to fit teachers' personal philosophy of education.

Training

The quantitative data listed training as the strongest utilizing factor. Both the qualitative and quantitative results of this study agreed with Doble (1978) and Slaugh's (1983) findings that teachers who participated in training sessions were more open to innovations. Participation and non-participation in PALMS training correlated with whether or not the participant was utilizing PALMS. Carr (1985) and Tracey (1993) also found a positive relationship between the amount

of training and the teacher's attitude toward utilization. The fact that teacher and class participation had more impact on teachers' utilization than the recommendation of administrators, specialists and colleges reflects Guskey's (1986) experienced-based staff development model.

Both the qualitative and quantitative results of this study revealed that high quality training was an important factor in the process of implementing change. Training influenced both initial interest and utilization, and the lack of training was a key factor for non-utilization. Some participants listed training as a factor that enhanced their implementation of the PALMS approach. Other participants listed the lack of training as an inhibiting factor affecting their utilization of PALMS. Participants also addressed training as a concern influencing utilization in terms of their desire for additional training, new ideas, and ongoing support.

The results of this research indicated that change agents promoting, planning, and creating educational change within school systems need to address the concerns of the participants implementing the change during ongoing training sessions. This factor agreed with the research findings of Bennis et al. (1985), who referred to this training and collaborative feedback as the reeducation process.

The training patterns of the teacher participants in this study supported the literature that staff development training was related to both the individual needs of the participants and the needs of the educational system (Howey & Vaughan, 1983; Loucks-Horsley 1987). The teacher participants in this study took the training sessions offered by the state and the system because the 1993 Education Reform Act mandated utilizing a new teaching approach. This approach was unfamiliar to the participants, so they voluntarily took the offered training to find out about this new approach and improve their teaching practice. The educational system and the state sponsored the training sessions because they wanted this approach utilized in the classrooms throughout the school systems and the state.

Most of the training results of this study agreed with prior findings that indicated little professional development involvement on the part of early career teachers, high professional development involvement from mid-career teachers, and very little professional development involvement from late-career teachers (Evans, 1989, May; Fessler & Christensen, 1992; Schein, 1978). The findings of this study indicated that teachers ready to retire and new teachers averaged fewer PALMS training hours than mid-career teachers. However, both the statistics

expressing a desire for more training by age and the average training hours by years of teaching indicated that the late career population of teachers actively participated in the PALMS training and desired additional training. In short, the late-career teachers participated substantially more than the new teachers. Furthermore, all the teachers in this study with 31 to 40 years of service participated in the training sessions. The average training hours of the late-career bracket was 60 training hours. The crosstabs by age revealed that 59.1% of the teachers between the age of 51 and 65 desired more training, and 40.9% did not. There are two possible explanations for the difference from prior research findings. The first possible explanation is based on the fact that the PALMS approach that was required by the 1993 Education Reform Act was very different from the way this age group of teachers was accustomed to teaching. Therefore, participating in training sessions to learn about the PALMS approach relieved the stress created by the 1993 Education Reform Act and returned the teachers to a professional comfort zone. The second explanation stems from the fact that the 1993 Education Reform Act canceled the teacher's lifetime teaching certificate and required the teachers to participate in 120 hours of professional development training in order to become recertified every 5 years (Massachusetts Department of Education, 1997, October).

Change agents responsible for promoting educational change must be aware of the influence that the teacher's career stages have on promoting educational change. This study, like the research of Carr (1985, December) and Tracey (1993, May), also found a positive relationship between the amount of training taken by the teachers and the teachers' attitude toward utilizing the innovation. Since this study showed that teachers in the middle of their careers averaged more training hours, and there was a direct correlation between the degree of utilization and the amount of training, the research data clearly suggested that one way for change agents to promote educational change within school systems involved planning specific strategies to attract both beginning teachers and teachers close to retirement to volunteer to participate in training sessions.

Approach Must Fit Teachers' Personal Philosopy of Education

Kirpatrick (1985) found that emotions affect change, and that forced change creates more resistance and takes longer. The third stage of Rogers' (1983) revised five-stage adoption model for the process of educational change (knowledge, persuasion, decision, implementation, and

confirmation) stresses the importance of providing participants with activities that promote a choice to adopt or reject utilizing the innovation. Barth (1988) found that organizational commitment, job satisfaction, and productivity increased when participation was voluntary.

The qualitative data in this study indicated that teacher attitude toward PALMS was a factor influencing utilization. When the participating teachers believed the approach was good for students, they utilized the PALMS approach. The PALMS approach was also utilized when it agreed with the teacher's educational philosophy. Utilization based on the teacher's educational philosophy agreed with Sparks' (1988) finding that a significant correlation existed between pre-training teacher attitudes regarding the importance of a technique and the actual post-training utilization.

If the PALMS approach disagreed with the teacher's educational philosophy, or the teacher perceived that the approach was not beneficial for students, the approach was not adopted, even though the approach was mandated by both the state and the school system and the teacher had participated in the PALMS training. This validated Harvey's (1990) findings that "Changees will resist efforts at change that they see as alien [and] imposed from without.... Participation in defining how change is to be implemented is a key to overcoming resistance" (p. 35). This finding also agreed with Bryson and Crosby's (1992) and Quirke's (1995) findings that resistance occurred when the participants believed that the change violated their core values or the values of the organization and was not in the best interest of the organization. This agreed with Fullan and Stiegebauer's (1991) findings that change mandates imposed from outside of the implementing organization often disagreed with the philosophies and values held within the implementing organization, and required resources and support that did not exist in the implementing organization. The research of Mohlman, Coladarci, and Gage (1982) also found that a conflict in the teachers' philosophy affected adoption. Mohlman, Coladarci, and Gage (1982) and Watson (1992, June) found that when the teacher's individual educational philosophy was in conflict with the innovation, the teacher would not see any value in adopting the innovation. These results supported Kirkpatrick's (1985) research, which cited the lack of ownership as a reason that participants resisted change.

The data from this study agreed with the current research literature which asserted that participant ownership was essential to the reform measure being implemented (Argyris, 1993, 1993, Winter; Argyris & Schön, 1978; Barth, 1988a; Bennis, 1995, December 6; Blanchard &

Lober, 1984; Blanchard et al., 1996; Covey, 1989, 1990; Fullan, 1993, 1993b; Schein, 1993, Autumn; Schön, 1987; Senge, 1990). The qualitative data indicating that teachers utilized the approach after training if it fit their philosophy and was good for students also validated Fullan's (1982) findings that the use of new materials was dynamically interrelated between the teachers' beliefs and behaviors. Fullan's (1982) and Smith's (1994) research discussed the fact that lasting change was a result of the teachers' belief that the change was worthwhile. The results of this study also found that teachers implemented and continued to utilize the innovation when they felt it was worthwhile. This study agreed with Fullan's (1982) findings that teachers judge the worth of the change/innovation on the need for the innovation, student interest, the teachers' clarity of understanding about what implementing the innovation will involve, the ease of implementation, how much additional time the innovation takes, the effect the innovation has on the teachers' energy, whether or not the innovation requires the teacher to learn a new skill, the teachers' sense of excitement and competence level regarding the innovation, and how the innovation interferes with the teachers' existing priorities.

Implementation Effect on Teaching and Learning

The data revealed that the approach took more time planning, and increased the amount of resources needed and time for lessons, but it had significant positive learning outcomes in all areas affecting student growth. This approach also provided more time for teachers to observe and remediate students. This agrees with Guskey's (1986) experienced-based staff development finding that student process and learning feedback were essential factors in promoting a change in teachers' beliefs and attitudes toward utilization. Stallings' (1989) staff development research found that a direct relationship existed between teacher training, school achievement and student performance.

The study findings revealed that teachers utilized the PALMS approach in spite of the increased time factors because of the positive student learning outcomes achieved when students were taught utilizing the PALMS approach. This change result relates to Mahler's (1996, December) finding that the predictor of change success was when "the perceived positive consequences of the change outweighed the perceived negative consequences of the change" (p. 112). Mahler (1996, December) also warned that "there may be a lag between the rational recognition of positive consequences and the emotional acceptance of the change" (p. 112). The

fact that teachers disclosed that the educational benefit for their students made the extra time and work involved in utilizing this approach worth their time and effort also agreed with Fullan's (1982) and Smith's (1994) research finding that long-lasting change was a result of the teacher's belief that the change was worthwhile. This was substantiated by the fact that comparing this study to the 1997 cycle two section of this ongoing action research project (Fuller, 1997, Summer) found that 18 of the 23 participants who had also participated in the 1997 study were still utilizing the approach. Only 4 of the 23 participants who were utilizing it in 1997 are not still utilizing it, and one participant who was not utilizing it in 1997 is still not utilizing it. This study found that teachers continued to utilize the approach because it was good for students. The teachers reported that the PALMS approach challenged students, promoted and developed problem-solving strategies and critical thinking, activated higher level thinking skills, was fun, was motivating, and that both students and teachers enjoyed learning with this approach.

Teacher Concerns Regarding Implementation

This study, like the research of Hord, Rutherford, Huling-Austin, and Hall (1987) in their Concerns-Based Adoption Model (CBAM), clearly demonstrated the importance and need for the change agent or facilitator to focus on the individual teacher's concerns, attitudes, and needs, as well as on the innovation and the context of utilization. This was evident by the factors listed as inhibiting utilization. Increased time and preparation, resources and materials, personal expense and cost were the major factors listed as inhibiting utilization in this study which agreed with Kirkpatrick's (1985) findings. Hall and Hord (1987) found policy makers and legislators who were removed from the classroom often mandated reform measures that disregarded the concerns of the participants who had to implement the changes. The data suggested that for implementation to be successful, these neglected concerns needed to be addressed.

Support

Both the qualitative and quantitative data revealed support as a factor influencing utilization. Margulies and Wallace (1973) cited management initiating and supporting the change process as one of their six propositions for successfully creating organizational change. The quantitative and qualitative data suggested that administrative commitment influenced whether or not teachers used PALMS. The qualitative data suggested that the lack of support by building and

central administration was a reason that some teachers were not using PALMS. Participants expressed a concern that the administration was no longer committed to or supporting the utilization of this approach because the training sessions were fewer and harder to access, or the support provided by Lead Teachers and PALMS Specialists had decreased and was not available in some buildings. Some teachers felt that the administration had abandoned this approach to focus on building literacy strengths in reading. The qualitative data found that when teachers felt that the administration was not supporting the innovation or had switched emphasis to a different curriculum area, like reading literacy, utilization of the innovation declined. This finding suggests a critical balance is necessary. It also indicates that administrators and teachers both need training in the reform measures. This research recommends the change agent provide training sessions to show teachers how the PALMS approach can be utilized to enhance reading literacy as well as the other approaches that teachers feel the administration is supporting utilizing now. It is important for teachers to understand the link between PALMS, reading literacy, and other approaches so that they continue using PALMS as well as the new approaches and strategies.

Other participants were concerned that the need to raise scores on the state-mandated testing would cause administrative support for this approach to be abandoned for the more traditional content "drill and kill" approaches utilized in the past. Then, the approach would end up like past reform efforts, "Here today, and gone tomorrow." These findings supported the suggestions from past change literature that participants resist innovations when they believe the leadership lacks a serious commitment to the change, or when they believe that the leadership is not capable of bringing about the change (Bryson & Crosby, 1992; Hammer, 1995; Harvey, 1990; Quirke, 1995).

The paired samples t-test data results from this study clearly communicated that if the teachers perceived the administrative support as forcing them to utilize the approach, the teachers rated the effectiveness of the approach lower and utilized it less. Another significant finding of this study was that when teachers cited the reason for utilization depended on it being mandated by the state or their school system they rated how the students liked the approach lower.

Therefore, based on the data, this researcher suggests that administrators show their support and interest in the innovation but not force staff members to implement the innovation. Administrators can accomplish this by making sure multiple opportunities are available that

provide staff members with time to investigate the innovation, see how it fits with their own educational philosophy, and find out, for themselves, if the approach would be good for their students. The teachers need time to explore the innovation within a non-threatening environment in order to determine if the student learning benefits are worth the teachers' investment costs. Administrators can show their support by notifying staff members when and where training sessions are being offered and show that they are interested enough in the innovation to attend the training sessions. Administrators can invite trained piloting teachers within the system, the trailblazers, who have utilized the approach and found it effective, to model hands-on activities for school staff and students through school-wide events or classroom demonstrations.

Administrators can also provide the opportunity and time for the teachers to visit the classrooms of colleagues who are successfully utilizing this approach. Administrators, by making materials available within the school, give teachers a chance to explore utilizing the innovation on their own, at their leisure. This will promote and support additional teacher interest in the innovation. Administrators can provide teachers with the opportunity and time to establish peer coaching and Cognitive Coaching (Costa & Garmston, 1994) sessions around utilization of the innovation to enhance teacher comfort in utilizing the innovation. Administrators, by providing multiple professional development opportunities for teachers to learn about the innovation, leave the final decision to implement the innovation up to the teachers' individual perception of the innovation's worth. This supportive approach validates Supranovich's (1980, September) finding that the teachers were the most important element in the school system, and everyone else should hold a supporting role for them if they want the change process to succeed. This endorses Showers' and Joyce's (1996, March) finding that "peer coaching study teams enhance staff development efforts and offer support for teachers implementing new strategies" (p.12). This agrees with Parkay's (1976) finding that the teacher makes the decision to change his/her own teaching practices, and before schools can change or improve, this must take place. This approach also validates Garmston's and Wellman's (1995, April) and Costa's and Garmston's (1994) writings on self-renewing school strategies.

Time

The qualitative data addressed this issue through the participants' concern that the required time for curriculum planning and classroom implementation of the PALMS approach exceeded

the time allowed by their school system. Teachers addressed the issue of time under several of the open-ended questions. Some teachers listed it as a concern regarding utilization, others cited it as an inhibiting factor, and some cited it as their reason for non-utilization. These results agreed with previous change literature that said that the fact that the change required more work was a reason that participants resisted change (Harvey, 1990; Kanter, Stein, & Jick, 1992; Kirkpatrick, 1985).

Factors Inhibiting Utilization

Cost of Materials

The cost of the materials and supplies was also a concern listed as negatively affecting teacher utilization, since the materials to implement the approach were not provided by the school system. This finding agreed with previous research that the successful implementation of an innovation depended on whether or not teachers had the resources they needed (Fullan & Stiegebauer, 1991; Fullan & Miles, 1992, June). This also supported Fullan's (1991) research that found mandated change often required resources that the organization expected to implement the change did not have.

Class Management Issues

Another concern of participants inhibiting utilization that change agents need to address during training sessions dealt with class management issues relating to lack of classroom space and the composition of the class. This finding suggests that change agents need to plan training sessions that specifically address how teachers can successfully implement the approach within all the various type and size classrooms that exist within the district. The class management issue findings of this study correspond with the reasons for resistance as a result of feeling less competent discussed by Hammer (1995), Harvey (1990), and Kanter, Stein, and Jick (1992) as well as resistance based on the loss of control of students discussed by Harvey (1990) and Kanter, Stein, and Jick (1992). The cultural and environmental reasons for resisting adopting innovations of Harvey (1990) and Quirke (1995) also addressed these findings.

State Testing Requirments

Other additional factors listed by participants in this study dealt with state testing requirements. Participants were concerned with the fact that the state standards and assessment system were too demanding for the class level of the participants' students.

Clarity

Clarity was a factor listed under inhibiting utilization, in addition to being a reason for requesting additional training. This agrees with Quirke (1995), and Kanter, Stein and Jick's (1992) findings that indicated that when participants lacked a clear understanding of an innovation, they resisted the change. It also supports the findings of Hammer (1995), Harvey (1990) and Kirkpatrick (1995) that a desire and concern for more training could be resistance based on a sense of insecurity or fear of failure. Kirkpatrick (1985) listed the factor of resistance as a condition that must be considered when building commitment to change for implementation and utilization to occur.

Factors Enhancing Utilization

This study found the major enhancing utilization factors were the approach must be good for students, quality training, support, providing materials, class participation in an event or demonstration, the approach fitting the teacher's philosophy, and class management strategies being provided. All of the factors suggest the need for the change agent to build a commitment to change within the organization.

Like Kirkpatrick (1985), the results of this research addressed the need to manage and build a commitment to the change. The qualitative data also validated Lindquist's (1978) observation that it was more effective to reduce resistance to change by "human relationship strategies" that appealed to the teachers' need for achievement, affiliation, and power, rather than just using the power and force imposed through the mandates. The current change literature on learning organizations, like Lindquist's (1978) research, focused on this cultural aspect of change and was based on Lewin's (1951) social dynamics and field theory research. Both Lindquist's (1978) research and the current learning organization theories supported utilizing human relationship strategies where teachers felt the need for the change and were willing to implement the

innovation (Argyris, 1993, 1993, Winter; Argyris & Schön, 1978; Blanchard & Lober, 1984; Blanchard, John, & Randolph, 1996; Covey, 1989, 1990; Putnam, 1994; Schein, 1993, Autumn, 1997; Senge, 1990). This study revealed that communication techniques based on information sharing and dialogue were key ingredients for success. The teachers and the system worked together to analyze the situation, problem-solve, share information, generate solutions, and evaluate the results. Strategies such as site-based management teams, training sessions, feedback, collaboration, mentoring, peer coaching, applied research, and reflective practice were employed to overcome organization barriers and resistance to change.

Proponents of this cultural problem-solving strategic approach to change believed in involving the participant throughout the entire change process, just as Patton (1997) did with his utilization-focused evaluation process approach to change implementation. Participants utilizing this dual change approach play an active role in analyzing the need for the change, plus organizing the training, as well as planning, designing, and implementing the change initiative strategies. The qualitative and quantitative data results from this study clearly suggest that an effective change agent promoting, planning, and creating educational change within school systems today, to be successful, needs to understand and combine both the human relationship problem-solving strategies used by learning organizations and the utilization-focused evaluation approach used by Patton (1997). This combination approach made it possible to assess the improvement, growth, and development fostered within the organization, that took place both within the individuals in the educational system and the system through a process of continuous learning, discussion, and feedback.

Significance of the Study

The significance of this study lies in the value that the findings have for change agents working in schools systems to plan, create, and provide teachers with effective quality training that will meet the needs and desires the teachers have expressed in this research. The prime relevance of this study is for change agents working in this urban Southeastern Massachusetts school district. However, the results can be transferred and utilized by other districts. Key factors necessary for supporting teachers in implementing innovations include providing:

- Quality Training

- Ongoing Support
- Resources and Materials
- Planning Time
- Classroom Management Strategies

This study also provides change agents with information about how the 6-year implementation process affected the teachers in this system. This study revealed the factors that teachers felt influenced their utilization of the educational changes mandated in the 1993 Education Reform Act were:

- Mandated Change
- Training
- Attitude, Belief and Ownership
- Availability and the Cost of Resources
- Time
- Space, Class Size, Class Type, and Subject Content
- Building Administrator, Central Administration and Administrative Commitment

The key significance for this researcher was the future training "how to proceed data" that it provided to meet the needs of the teachers. The study data suggested that successful teacher training should include showing teachers at their own grade level, with their particular size and type classroom, that the approach or innovation works with their students.

The factors influencing teacher utilization of PALMS cited in the study also suggested that planned, structured events had a powerful influence over whether or not teachers adopted the PALMS approach. The key activities influencing utilization listed by the teacher participants involved active participation of both students and teachers. Teachers indicated that modeling of the PALMS approach, classroom demonstrations and events such as Hands-on Science Fairs and Family Math and Science Nights, demonstrated that the approach was effective, enjoyable, and worth implementing. Hands-on Science Fairs and Family Math and Science Nights communicated the effectiveness of this approach not only to the teachers, students, parents, and

community members who attended, but also to the general public through newspaper and television coverage.

This project suggested that the staff development training sessions that actively involved the teachers as student learners positively influenced teachers' use of PALMS. The study also affirmed that when authority figures and mandates were cited as the reason for teachers adopting an innovation, the teachers in the study rated the effectiveness of the approach and training lower.

The change agent's improvement strategies recommended from this study were grounded in the data supplied by the participants that showed what was working for teachers and students in classrooms combined with the research literature for promoting organization change. The vastly changing global economy and the rising cost of professional development has increased the demand for change agents to plan, create and implement high quality cost effective training programs that promote statewide educational reform measures that focus on both content and problem solving outcome skills in order to maximize the learning potential of every student and create a nation of adult workers capable of working collaboratively and thinking critically.

This study isolated the relevant factors that teachers felt influenced them to change their attitude toward the PALMS approach and implement the educational reform measures into their classroom teaching and learning practices. Therefore the data from this study will help change agents determine the factors that influenced what a system did that:

- impacted teacher utilization of an innovation
- had little or no influence on teacher utilization of an innovation.

This study, like Watson's research (1992, June), found that demographic teacher background information factors were not relevant indicators for determining teacher attitude toward innovation implementation.

The data revealed that the teachers' initial interest was sparked through the recommendations of others. However, teacher adoption and utilization were influenced by the teachers' perception of the effectiveness of the innovation on student learning. This finding affirms Evans' (1993, September) research that teachers need reassurance that what they replaced their past "tried and true" teaching and learning methods with does, in fact, work effectively with their students. The utilization data clearly revealed that the deciding factor on whether or not the approach or innovation was actually utilized depended on each individual classroom teacher's perception of

the approach. This finding further supports Evans' (1993, September) recommendation that the change agent be motivational and "build a commitment to the innovation among those who must implement it" (p. 20). This also agrees with Walton's (1986) finding that "Education and Training [is] an Investment in People" (p. 84).

Blanchard and Johnson (1986), Blanchard and Lober (1984), and Blanchard et al. (1996) captured the essence of the change agent's role when they explained that managers need to manage both people and results to be effective, and neither should be at the expense of either one. Elmore's (1990), Glickman's (1990, September), and Murphy's (1991) research found that empowerment was the driving force formulating the new roles being demanded of teachers through the current reconceptualization of schools and educational reform efforts. Based on the findings from this study and prior research, this researcher suggests and recommends that the change agent utilize and provide training sessions based on the "One Minute Manager" and empowerment research of Blanchard and Johnson (1986), Blanchard and Lober (1984), and Blanchard et al. (1996). Their management research suggests how the change agent and the teachers can work together to develop effective strategies to create educational change within school systems. Their research stressed the importance of sharing information, utilizing feedback, and enhancing job performance and learning by investing in people through training, developing job skills, modeling quality performance and effective work habits, plus learning problem-solving techniques and recording data strategies.

This researcher further recommends that the change agent conduct training sessions explaining Deming's *14 Total Quality Control Management and Leadership Principles* for both administrators and teachers. Like Deming's Total Quality Management (Deming Institute, 1966, 1994; Deming, 1986), Blanchard taught employees how to evaluate their work in terms of quantity and quality. Once this was done, the manager, or in this case, the change agent, looked to see what the employee (teachers) had done right and supported their efforts.

The work of Covey (1990), Kearney and Tashlik, (1985), Patton (1997), Putnam (1994), Schön (1987), and Argyris (1993, 1993, Winter) also promoted effective communication strategies to help the change agent and teachers work together as a team to create ways to promote educational change within the education system. This researcher recommends offering communication and teamwork problem-solving strategy training sessions for teachers and administrators based on this research. Their strategies will help the change agent to further

develop communication strategies for working with the teachers who are the human resource needed to promote effective change within the educational system. Effective teamwork and communication skills will foster ways the change agent can work together with the teachers, and teachers can work with each other to improve and enhance the factors that the teacher participants in this study indicated influenced their initial interest, adoption, utilization, and non-utilization of the innovation. This recommendation is based on the research work of Fullan (1990) that explains that school systems utilize staff development: (a) to facilitate implementation, (b) as an innovation in itself, and (c) as a means of institutional development. However, in order to sustain change, Fullan (1990) found that the school systems must look at and utilize staff development in terms of institutional development.

Based on the data results, this researcher recommends that the change agent provide routine, ongoing training both during and after innovation implementation. This will keep communication lines between the teachers and the system open, and promote continuous teacher collaboration which allows information sharing and provides teacher feedback within a problem-solving, school-improvement, structural context. The qualitative data results revealed that when the Lead Teachers and PALMS Specialists discontinued modeling lessons and PALMS training sessions became less frequent, teachers believed that the system was no longer supporting utilization of this approach and was stressing reading literacy instead. The recommendation of routine, ongoing training sessions is made in order to avoid this type of misconception.

This approach validates the teachers' professionalism and allows the teachers an active voice in the change process. This approach also improves the change process by providing formative evaluative feedback regarding the effectiveness of the innovation within different classroom settings and student populations at different educational levels within individual schools and the school system. This collaborative training technique involving routine, ongoing support and feedback is supported in the learning organization research of Senge (1990) and the utilization-focused evaluation work of Patton (1997). Senge (1990) and Patton (1997) found that this approach enhances risk taking and fosters an openness and receptivity toward change developed through a gradual, ongoing process of continuous change. This technique is also supported in the supervision research work of Glickman, Gordon, and Ross-Gordon (1995) for building and establishing a cultural climate that supports change within the school system. This cultural

climate accepts change as a natural growth process that develops improvement strategies as part of the normal routine learning operation of the system.

Fullan (1990) also suggested transforming the culture of the organization by refocusing staff development so that it becomes part of the overall change process. Fullan (1990) suggested that staff development should be continuous and include a variety of formal training workshops as well as informal teacher exchange sessions. This recommendation to provide ongoing collaboration, feedback, and problem-solving training sessions agrees with Stalling's (1989) staff development model for promoting teacher change. Stallings' (1989) model included: (a) learn by doing—try, evaluate, and try again; (b) linking prior knowledge to the new innovation; (c) learn by reflection and problem-solving; and d) learn in a supportive environment where teachers can share both problems and success situations.

The results support Evans' (1993, September) findings that change is a generative process that is personal, and is accomplished by the people within an organizational system. Evans (1993, September) explained that during the change process, the very culture of the workplace changes, causing a sense of loss in the individuals involved in the change because it discredits the assumptions by which the people live and make sense of their world. This researcher recommends, based on the study findings, that the change agent provide the teachers with new ideas and classroom support during ongoing lesson modeling and active participation training sessions. The sense of loss was demonstrated in the study findings by the fact that the participants' teaching comfort zone had been interrupted because their "tried and true" teaching methods and instructional units were altered with the implementation of this hands-on, inquiry-based, cooperative learning problem-solving approach. This factor was supported by the fact that teachers were requesting additional training sessions in management strategies and curriculum ideas to fill this gap and support their transition into a new level of professional comfort utilizing the innovation. The qualitative data found that teachers desired both additional concept and content ideas, not only to implement the innovation in their classroom, but to also continue to utilize the approach in their classroom. The qualitative data indicated that teachers wanted specific grade level training sessions that provide ideas and support on how to correlate the approach with the state-mandated curriculum frameworks. The data also revealed that teachers wanted thematic unit ideas and suggestions for incorporating the approach in different subject areas. The data found that teachers requested behavior management strategies and

organization help utilizing the approach with large classes and diversified student populations. Both the qualitative and quantitative data revealed that the teacher participants listed ongoing support as having a high influence on affecting their decision to utilize the innovation, as well as to insure continued utilization. Based on the fact that this study was conducted 6 years after initial implementation of the PALMS approach, the study findings suggest that change agents continue to provide new ideas and classroom support after the innovation has been implemented.

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Appendix

RESEARCH METHODOLOGY SURVEY

Teaching Components Evaluation by Approach Utilization

Dear Colleague,

The voices of educators need to be heard for effective realistic educational reform. Please take a few minutes to fill out this survey.

Thank you.
June L. Fuller

Name_____ (Optional) Gender ____ Ethnicity_____ Year Born ____

** Please sign the informed consent form even if you have selected not to fill in your name here. The Fielding Institute requires a signed consent form from every research participant. The last page may be detached and returned separately if you so desire. Check this box to show you have signed and returned the consent form separately. ** ☐

School System_____ School_____ Grade ___ Class Size___

Type of Class: Regular Ed. ___Special Ed.___ Inclusion ___Bilingual Ed.___

Position _____ Number of Years in Education Profession ___Degree Level __

Please indicate how many years you have spent in each position: Teaching ____

Reg. Ed. ____ Special Ed. ____ Inclusion Setting ____ Bilingual Ed. _____

- Please list the approximate number of PALMS training hours you have had each year.

  1993 ___ 1994 ___ 1995 ___ 1996 ___ 1997 ___ 1998___ 1999___ = Total Training Hours ___

  Using the following code please rate the quality of the overall PALMS training you received.

  TOTAL OVERALL PALMS TRAINING QUALITY: LOWEST HIGHEST
  1 2 3 4 5

- Are you currently using the PALMS integrated hands-on inquiry based cooperative learning approach in your classroom? YES___ NO___

  If yes, please rate the overall effectiveness of the PALMS approach.

  NOT VERY EFFECTIVE HIGHLY EFFECTIVE
  1 2 3 4 5

  If yes, please rate how your students like using this approach.

  STUDENTS HATE IT STUDENTS LOVE IT
  1 2 3 4 5

  If no, are you planning to use the PALMS approach in your classroom? YES __NO__
  If no, why not?

- **If you are using or planning to use the PALMS approach, please list the factors in the training that influenced you to use this approach in your classroom.**

- **Please check if your utilization of PALMS has increased, decreased or remained the same since your last training session and explain why.**

  INCREASED _____ DECREASED _____ REMAINED THE SAME_____ BECAUSE:

- **Do you feel more PALMS training would be beneficial? YES___ NO ____**
  If yes, please list specific areas you would like more training in:

- **How has utilizing the PALMS approach involving an integrated hands-on inquiry based cooperative learning approach changed your teaching?**

- **Please place an X beside the subject(s) in which you utilize this approach and indicate the percentage of time on a weekly basis that you utilize this approach.**

_____ Reading	_____% Weekly
_____ Math	_____% Weekly
_____ Social Studies	_____% Weekly
_____ Science	_____% Weekly
_____ Integrated Across the Curriculum Approach	_____% Weekly

- **What initially got you interested in utilizing this approach? Please explain.**

- **Please list in numerical order of importance (1=most important, 2 = next most important etc.) only the factors that influenced you to adopt the PALMS approach.**

DO NOT LIST EVERY CHOICE. LIMIT YOUR RESPONSE to only those factors that actually related to what influenced your own personal attitude toward UTILIZING THIS APPROACH.

- _____ **1993 Mass. Ed. Reform Act**
- _____ **PALMS Training Sessions**
- _____ **PALMS Lead Teacher**
- _____ **PALMS Specialist**
- _____ **Colleague**
- _____ **Family Math & Science Nights**
- _____ **Peer Coaching**
- _____ **Receiving Mentoring Assistance**
- _____ **Your Class Participating in an Event utilizing this approach**
- _____ **Central Administration**
- _____ **Building Administration**
- _____ **Ongoing Support**
- _____ **MCAS (State Testing)**
- _____ **Other (please explain):**

- **What are your concerns regarding this approach?**

- **What factors enhance utilizing this approach? Please explain why for each factor?**

- **What factors inhibit utilizing this approach? Please explain why for each factor?**

- **Other comments:**

Table 1

Background Characteristics of Teacher Participants

	%	N
Gender		61
Female	91.8	56
Male	8.2	5
Ethnicity		49
Caucasian	93.9	46
Hispanic	2.0	1
Black	2.0	1
Other	2.0	1
School level		60
Elementary	85.0	51
Junior High	10.0	6
High School	5.0	3
Degree		61
BS/BA	66.6	40
MS/MA	34.4	21
Type of Class		61
Regular Education	65.6	40
Inclusion	18.0	11
Special Education	9.8	6
Bilingual Education	4.9	3
Teachers who service all types of classrooms: Regular Education / Special Education / Inclusion / Bilingual Education	1.6	1
Position		62
Teacher	90.3	56
Permanent Substitute Teacher	4.8	3
Special Education Teacher	3.2	2
Title I Teacher	1.6	1

Table 2

Background Characteristics of Teacher Participants

	$\bar{X}$	SD	N
Age	47.78	8.91	50
Number of Years in Education Profession	21.61	10.05	61
Number of Years in Various Educational Positions			
Title I	21.50	2.12	2
Regular Education	19.62	11.77	47
Special Education	16.92	7.45	13
Bilingual Education	14.50	10.21	4
Inclusion	4.84	5.95	19
Average Class Size	19.29	4.59	55
Grade Level	3.67	2.67	52

Table 3

The Effect Training Participation Had on Teacher Utilization of PALMS

	%	N	%	n
PALMS Training		62		
Trained in PALMS Approach	88.7%	55		
Not Trained in PALMS Approach	11.3%	7		
Training Influence on Utilization		62		
Teachers Using PALMS	82.3%	51		
Trained Teachers Who are Using PALMS			94.1%	48
Untrained Teachers Who are Using PALMS			5.9%	3
Teachers Not Using PALMS	17.7%	11		
Trained Teachers Not Using PALMS			63.6%	7
Untrained Teachers Not Using PALMS			36.4%	4
Teachers Who Have Taken PALMS Training		55		
Trained Teachers Using PALMS			82.3%	48
Trained Teachers Not Using PALMS			12.7%	7
Teachers Who Have Not Taken PALMS Training		7		
Untrained Teachers Utilizing PALMS			42.9%	3
Untrained Teachers Not Utilizing PALMS			57.1%	4

Table 4

Training Factors Influencing Utilizing PALMS

	# of Responses
Approach Fits with Teacher's Philosophy	20
Approach Good for Students	16
Effectiveness of the Training	10
Approach Mandated	5
More Training Needed	2

Note. N = 53. The question to which participants responded was, "If you are using or planning to use the PALMS approach, please list the factors in the training that influenced you to use this approach in your classroom."

Table 5

Factors Affecting Utilization of PALMS Since Last Training

	N	Increased	Decreased	Remained the Same	
				Utilization	Non Utilization
Effect on Participant's Use	48	12	15	6	15
Factors	n	n	n	n	n
Approach Fits / Doesn't Fit Teacher's Philosophy	10	2	2	4	2
Lack of Time	10	0	3	1	6
Effective Training / Need More Training	10	3	4	1	2
Approach Good / Not Good for Students	6	4	2	0	0
Class Type / Class Size Not Conducive to PALMS	4	0	1	0	3
Approach Mandated	4	3	0	0	1
Lack of Support	2	0	2	0	0
High Cost of Materials	2	0	1	0	1

Note. The question to which participants responded was, "Please check if your utilization of PALMS has increased, decreased, or remained the same since your last training session and explain why."

Table 6

Training Participation and PALMS Use Affected by Number of Years Teaching

Number of Years Teaching	n	# Trained	Training Hours	$\bar{X}$ Hours of Training
1 - 10 Years Teaching	13	8	233	29.13
Using and trained		6	209	34.83
Not using but trained		2	24	12
5 Not trained				
11 - 20 Years Teaching	11	10	216	24.06 *
Using and trained		8	204.5	25.56
Not using but trained		1	12	12
Not using rated training		1	Unknown	
1 Not trained				
21 - 30 Years Teaching	26	25	3748	162.96 **
Using and trained		21	3729	177.57
Using rated training		2	Unknown	
Not using but trained		2	19	9.5
1 Not trained				
31 - 40 Years Teaching	11	11	668	60.73
Using and trained		10	600	60
Not using but trained		1	68	68
Years Teaching Unknown	1	1	Unknown	
Using and trained		1	Unknown	

Note. * Only 9 teachers listed their training hours. ** Only 23 teachers listed their training hours.

Table 7

Crosstabs for Age by Desire for More Training

	YES		NO			
Age	n	%	n	%	X^2	p
28 - 40	8	88.9	1	11.1	5.15	.076
41 - 49	14	87.5	2	12.5		
51 - 65	13	59.1	9	40.9		

Note. While not significant, the data suggest that change agents provide further training for all age groups.

Table 8

Factors Influencing Initial Interest in Implementing the PALMS Approach

	# of Responses
Training	20
Approach Fits with Teacher's Philosophy	11
1993 Education Reform Act / Teacher's Manual	11
Approach Good for Students	10
Colleague / Lead Teacher	3
Paid Training Sessions / Free Materials	2
Class Participating in Event Utilizing This Approach	1

Note. N = 58. The question to which participants responded was, "What initially got you interested in utilizing this approach? Please explain."

Table 9

Factors Influencing Utilization of PALMS

	Yes		No	
	n	%	n	%
PALMS Training Sessions	43	72.9	16	27.1
Your Class Participating in an Event	28	47.5	31	52.5
Education Reform Act of 1993	23	39.0	36	61.0
Family Math and Science Nights	15	25.4	44	74.6
MCAS	15	25.4	44	74.6
PALMS Specialist	14	23.7	45	76.3
Colleague	14	23.7	45	76.3
PALMS Lead Teacher	13	22.0	46	78.0
Building Administrator	10	16.9	49	83.1
Ongoing Support	8	13.6	51	86.4
Peer Coaching	7	11.9	52	88.1
Central Administration	6	10.2	53	89.8
Receiving Mentoring Assistance *	4	6.8	55	93.2
Other	4	6.8	55	93.2

Note. Listing on table in order from most to least level of use. N = 59 for each factor. Other factors influencing participants utilizing PALMS that were listed by one person each included: "textbook changes," "my own belief that this is a good approach," "there was no other option—course (home economics) must be taught this way," it worked— always try new things and utilize what works (paraphrased). * This urban area of Southeastern Massachusetts has a veteran staff of teachers, consequently there were very few new teachers with mentors.

Table 10

Paired Samples T - Tests for Factors Influencing Utilization

	NO			YES				
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	t	p
Education Reform Act								
Total Overall PALMS Training Quality †	31	4.16	.73	17	3.59	.51	2.86	.006 **
Use of Integrated Approach †	34	24.71	32.03	20	8.50	15.65	2.49	.016 *
PALMS Training Sessions								
Total Overall PALMS Training Quality †	11	3.55	.69	37	4.08	.68	- 2.28	.027 *
Colleague								
Number of Years in Education Profession	44	23.55	9.55	14	16.57	10.35	2.33	.023 *
Number of Years in Regular Education Position	34	22.32	11.08	12	11.42	10.55	2.97	.005 **
Peer Coaching								
Overall Effectiveness of PALMS Approach †	41	3.98	.69	6	3.33	.52	2.19	.034 *
Grade	43	3.60	2.08	6	2.00	1.10	2.93	.014 *
Number of Students with Whom you Work Average Class Size	47	19.53	4.40	5	14.40	2.88	2.54	.014 *
Receiving Mentoring Assistance								
Utilization Percent in Social Studies	52	15.29	23.59	4	2.50	5.00	3.16	.006 **
Number of Years in Regular Education Position	43	20.58	11.47	3	3.67	1.53	8.64	.001 ***
Administration								
Overall Effectiveness of PALMS Approach †	41	4.00	.67	6	3.17	.41	2.95	.005 **
How Students Like								

Table 10 (Continued)

Paired Samples T - Tests for Factors Influencing Utilization

	NO			YES				
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	t	p
PALMS Approach †	42	4.29	.81	6	3.50	.55	2.31	.026 *
Utilization Percent in Social Studies	50	15.70	23.95	6	3.33	5.16	3.10	.004 **
Utilization Percent in Science	49	31.02	30.03	6	13.33	15.06	2.36	.038 *
Building Administration Grade	40	3.65	2.17	9	2.33	.87	2.94	.006 **
Ongoing Support								
Utilization Percent in Reading	50	15.94	25.12	5	4.00	5.47	2.76	.010 **
Utilization Percent in Social Studies	50	15.70	23.95	6	3.33	5.16	3.10	.004 **
Age	42	49.00	8.73	7	41.86	7.69	2.03	.048 *
MCAS Testing								
Total Overall PALMS Training Quality †	35	4.09	.70	13	3.62	.65	2.10	.041 *
Utilization Percent in Science	41	34.07	30.91	14	14.50	17.24	2.93	.005 **

Note. † 1 - 5 Scale where 1 = lowest, 5 = highest. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 11

Crosstabs for Use of PALMS Approach

	Utilization of PALMS Approach					
	Yes		No			
	%	N	%	N	X^2	p
Gender						
Male	60.0	3	40.0	2	1.64	.230
Female	83.3	45	16.7	9		
Degree						
BA/BS	78.9	30	21.1	8	.32	.731
MA/MS	85.0	17	15.0	3		
Years in Teaching Profession						
0-10	58.3	7	41.7	5	5.34	.15
11-20	81.8	9	18.2	2		
21-30	88.0	22	12.0	3		
31-40	90.0	9	10.0	1		
Age						
28-40	66.7	6	33.3	3	3.08	.214
41-49	76.5	13	23.5	4		
51-65	91.3	21	8.7	2		
School Level						
Elementary	83.7	41	16.3	8	2.25	.325
Junior High	66.7	4	33.3	2		
High School	50.0	1	50.0	1		
Type of Class						
Regular Ed.	84.6	33	15.4	6	2.63	.622
Special Ed.	66.7	4	33.3	2		
Inclusion	70.0	7	30.0	3		
Bilingual	100.	2				
Reg/Sped/ Incl/Bil	100.	1				

Note. While not significant, the data suggest that change agents provide further training for teachers with 0-10 years of teaching, teachers within the 28-40 year age bracket, junior high and high school teachers, special education teachers and inclusion teachers.

Table 12

ANOVAS for School Level by Perceived Change in Classroom Teaching and Learning Components

		Difference in Teaching and Learning Component Scores After PALMS Use Minus Before			
School Level	N	$\bar{X}$	SD	F	p
Elementary	45	28.80	13.87	4.12	.023
Junior High	2	36.50	12.02		
High School	3	6.67	9.07		

Note. The differences, after minus before, were summed. The data suggest that change agents target junior high and high schoolteachers for further training.

Table 13

ANOVAs for Effectiveness Rating of PALMS Approach by Level Taught

	Effectiveness of PALMS Approach				
Teaching Level	N	$\bar{X}$	SD	F	p
Elementary	41	3.85	.65	6.70	.003
Junior High	3	5.00	.00		
High School	2	3.00	.00		

Note. These data provide the change agents with information about the effectiveness of this approach and suggest change agents target junior high and high school teachers for further training.

Table 14

ANOVAs for How Students Like PALMS Approach by Level Taught

	Students Like Using PALMS Approach				
Level Taught	N	$\bar{X}$	SD	F	p
Elementary	41	4.24	.66	.89	.42
Junior High	4	4.00	2.00		
High School	2	3.50	.71		

Table 15

ANOVAs for Age by Rating of Effectiveness of PALMS Approach

	Effectiveness of PALMS Approach				
Age	N	$\bar{X}$	SD	F	p
28 - 40 years old	6	3.50	.55	4.65	.016
41 - 49 years old	12	4.33	.49		
51 - 65 years old	21	3.76	.70		

Table 16

Positive Concerns Regarding PALMS Utilization

Effect on Participants Use Category Factor Totals Approach Effective Concern Factors	Positive Responses 53 # of Responses	
Time and Resources	26	
Additional Lesson Time Needed		10
Additional Preparation Time Needed		4
Funding Source Needed to Cover Material Costs		4
Additional Classroom Space for Activities and Material Storage Needed		2
More Resource Materials Needed		4
More Classroom Help Needed / More Parental Involvement Needed		2
Training	8	
More Training / Call back: Ideas		4
More Support Needed		3
More Background Knowledge Needed		1
Class	8	
Class Type: Some Students and Classes are too Hyper to Work in Teams		2
Class Size: Manageable Given Lesson Activity and Resources Needed		2
Class Management: Control Over Learning Experience and Behavior		4
Curriculum	7	
Approach Applicability to Frameworks: State Standards		2
Is Approach Preparing Students for MCAS: State Comprehensive Testing		3
Assessments: Does Approach Meet Grading Accountability Requirements		2
The Approach is Good for Children / Effective / Beneficial	2	
Approach Fits with Teacher's Philosophy	2	

Note. The question to which participants responded was, "What are your concerns regarding this approach?"

Table 17

Factors Enhancing Utilizing PALMS

Enhancing Factors	# of Responses
Approach Good for Students	50
	# of Responses
Motivates / Fun: Kids like it / Holds Attention / Participation	18
Social skills / Non - competitive / Everyone Successful	12
Knowledge / Study Skills / Graphic Organizers	7
Critical Thinking Skills / Problem-Solving Skills	5
Communication Skills: Verbal and Written	4
Accommodates All Learning Styles / Abilities	4
Training / Support / Provided Materials / Class Event or Demonstration	9
Approach Fits Teacher's Philosophy	5
Class Type / Class Size / Class Management	3

Note. N = 67. The question to which participants responded was, "What factors enhance utilizing this approach? Please explain why for each factor."

Table 18

Factors Inhibiting Utilizing PALMS

	# of Responses
Lack of Time / Increased Preparation	19
Class Type Not Conducive to Using PALMS / Class Size Not Conducive to Using PALMS / Class Management Problems Using PALMS	16
Lack of Resources / High Cost of Materials / Need for Additional Space	15
Subject Content Not Conducive to Using PALMS / Alignment with Curriculum Frameworks / Preparation for State Testing (MCAS) / Adequate Assessments	9
Lack of Training / Lack of Support	6
Approach Doesn't Fit with Teachers Philosophy	4

Note. N = 69. The question to which participants responded was, "What factors inhibit utilizing this approach? Please explain why for each factor."

Table 19

Factors Influencing PALMS Non-Utilization

	# of Responses
Need for More Training	3
Use AIMS Instead	1
Not Applicable: Teaching Specific Program Methodologies	1
Creates Difficulties with Classroom Management	1
Lack of Time	1
Students Lack Understanding and Comprehension of Concepts	1
Use Later: Not Appropriate First Semester	1

Note. N = 9. The question to which participants responded was, "Are you currently using the PALMS integrated hands-on inquiry-based cooperative learning approach in your classroom? Yes ___ No __X__ If no, why not?"

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