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Recommended Citation

Belcher, Cheryl D., "A Descriptive Analysis of the Perceived Importance and Use of Scientific Research-Based Instructional Strategies Among West Virginia Teachers" (2007). *Theses, Dissertations and Capstones.* Paper 56.

A DESCRIPTIVE ANALYSIS OF THE PERCEIVED IMPORTANCE AND USE OF SCIENTIFIC RESEARCH-BASED INSTRUCTIONAL STRATEGIES AMONG WEST VIRGINIA TEACHERS

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Dissertation Submitted to the Faculty of the
Marshall University Graduate College
in partial fulfillment of the
requirements for the degree of

Doctor of Education
in
Curriculum and Instruction

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Huntington, West Virginia, 2007

Key Words: Scientific research-based, instructional strategies, highly qualified teacher

ABSTRACT

A Descriptive Analysis of the Perceived Importance and Use of Scientific Research-Based Instructional Strategies among West Virginia Teachers

This study was designed to examine the perceived importance and extent of use of scientific research-based instructional strategies among West Virginia teachers. Specifically, the study investigated the extent to which perceived importance and frequency of use of scientific research-based instructional strategies differ between highly qualified teachers and non-highly qualified teachers. The core of the research was focused on ten scientific research-based instructional strategies identified by the Mid-Continental Regional Educational Laboratory. Participants were asked to complete a researcher-designed survey, the *Instructional Strategies Inventory*, to rate perceived importance and frequency of use for each of the ten strategies. The population for this study consisted of teachers employed in West Virginia public schools pre-kindergarten through twelfth grades during the 2005-06 school year according to the West Virginia Education Information System (N=21,625). The sample was stratified based on the highly qualified status of the teacher. Of the 440 teachers randomly selected, an overall return of 229 responses or 52% was obtained with two mailings. Results of the study revealed that West Virginia teachers perceive scientific research-based instructional strategies as important to instruction. Moreover, results confirmed that West Virginia teachers have incorporated the use of scientific research-based instructional strategies into weekly classroom practices. Closer inspection of the results, however, revealed no significant difference between highly qualified teachers and non-highly qualified teachers with regard to perceived importance or frequency of use of the strategies. These findings address the problem that NCLB defines highly qualified teacher by credential only, failing to address teacher quality in the definition. This disconnect ignores a significant body of research that provides evidence that the teacher is the most decisive factor in student learning. The results of this study add to the body of knowledge on scientific research-based instructional strategies as well as inform lawmakers in the task of developing powerful legislation that brings about substantive change.

DEDICATION

This dissertation is dedicated to all educators who strive to change the world one student at a time. We know in our hearts that EVERY student counts and that EVERY teacher has a special calling to respond to the needs of others.

ACKNOWLEDGMENTS

I write this dedication drained and assured that not one more word will come to me to describe the journey to a Doctor of Education degree. However, as I begin, my thoughts turn to my family. It is their inspiration that brought me here today as the search for terminal degrees has been a family affair—my husband, son, daughter and, now, I have all embarked on this journey during the past five years. Each has lent their special quality to me, my husband his intelligence, my son his dedication, my daughter her persistence. I can only imagine where the future will take each of us.

In addition to the support from my family, I have had incredible support from my committee. Dr. Heaton and Dr. Sullivan have spent endless hours editing and providing feedback. I extend a special thank you to Dr. Pauley, my chair, who has given generously of his intellect, experience and "early morning" time to guide me through this process. I have no doubt that I have the best study possible because of my committee's influence.

Finally, I want to acknowledge the crazy sock club for proving beyond a shadow of a doubt that you really are smarter when wearing your socks. I must also acknowledge my pink flamingo buddies for showing no fear of being different, having vision and thinking outside of the box. Flamingos don't just fly; they soar far and free. And finally to the unknown individual who coined the term "cohort" to name one of the most innovative educational ideas. Without my cohort I wouldn't be here. Their support, friendship and model of scholarship got me to this point in my life.

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CHAPTER ONE: INTRODUCTION TO THE DISSERTATION

Passage of the No Child Left Behind Act of 2001 (NCLB) expanded the role of the

federal government in education and set forth requirements that affect every public school in

our nation. At the core of the NCLB legislation are increased accountability measures

designed to ensure improvement in academic achievement for all students regardless of race,

ethnicity, disability or socioeconomic level. To accomplish this task, NCLB prescribes a

highly qualified workforce that engages in scientific research-based instructional strategies

that provide evidence of effectiveness with diverse student populations. Educators can no

longer simply focus on the art of teaching but must equally embrace the science of teaching.

According to NCLB, a highly qualified teacher is defined as a teacher who has earned

at least a bachelor's degree and holds full state certification in the assigned teaching field

with no waivers for licensure on an emergency, temporary or provisional basis. In addition,

teachers are required to pass a rigorous test adopted by the state to demonstrate content

knowledge of the subject area of certification. NCLB defines sanctions for schools that

receive Title I funds but fail to meet the standards as described in the law. For Title I schools

that fail to provide highly qualified staff, sanctions include written notification to parents that

a non-highly qualified teacher is providing services to their children. Parents may then

choose to transfer their children to a classroom or school which provides a highly qualified

teacher (U.S. Department of Education, 2005). While not included in the definition of highly

qualified teacher, NCLB also defined the use of scientific research-based instructional

strategies. Within the context of NCLB, scientific research-based instructional strategies are the teaching methods and strategies documented by a scientific process describing the effectiveness of those practices. The method for determination of the existence of a scientific research base includes the use of randomized experimental trials, large correlational studies, and meta-analysis of relevant research. In addition, relevance to the practice of education and significance of the work, including effect size, provide proof of the scientific research base (U.S. Department of Education, 2005).

While the law stipulates the use of scientific research-based instructional strategies, this requirement is not included in the definition of the highly qualified teacher. As a result teachers may meet the standards for highly qualified status but fail to use the evidence-based instructional strategies that assure that all students can learn. Moreover, a teacher may not meet the standards for highly qualified status, but in fact, their students may achieve at the mastery level or higher on state-required testing.

Initially, provisions in NCLB allowed flexibility for teachers not new to the profession to use an alternative method such as the High Objective Uniform State Standard of Evaluation (HOUSSE) process to demonstrate subject matter competency. While this alternative remains available to teachers, HOUSSE processes developed by states have undergone increased federal scrutiny. In fact, the HOUSSE process for West Virginia was recently denied federal approval and therefore must be redesigned and resubmitted for approval. As a result of the denial the number of non-highly qualified teachers increased from 4% to 37% of the teachers employed in the state.

In response to feedback from educators across the nation, the United States Department of Education recently released guidelines for additional flexibility in meeting the

requirements for highly qualified teacher status. The original expectation of NCLB was that all teachers would meet the requirements before the end of 2005-06 school year; however, the U.S. Department of Education has identified three areas of exception. In response to the necessity for teachers in rural areas to teach multiple subjects, the new guidelines permit an additional three years to meet the requirements for those teachers who are certified in one subject. Furthermore, science teachers have been granted flexibility to demonstrate that they are highly qualified either in the broad field of science or individual fields of science such as physics, biology or chemistry, based on state certification requirements. Finally, for teachers currently placed in multi-subject teaching assignments seeking highly qualified status, the new flexibility streamlines the evaluation process by outlining a method for these teachers to demonstrate subject knowledge content through a single process rather than a separate process for each subject for which they are seeking highly qualified status (U.S. Department of Education, 2005).

While these new guidelines appear to extend the time or lessen the requirements for specific groups of teachers to become highly qualified, this flexibility continues the focus on credentials alone as the criterion for highly qualified status. The changes in the guidelines fail to address the need for evidence of effective instructional practices that yield improved student achievement. It appears that lawmakers have failed to recognize the body of educational research that supports the premise that effective teaching is not simply dependent upon credentials that provide evidence of content knowledge, but must also include the use of effective instructional strategies if all students are to master the prescribed standards.

Rationale for the Study

Enactment of NCLB legislation defines the criteria which must be met for teachers to achieve highly qualified status. Furthermore, NCLB requires educators to expand the notion of teaching as an art by incorporating the use of scientific research-based decisions and instructional practices. While NCLB mandates the use of scientific research-based instructional practices, this requirement is not stipulated in the definition of highly qualified teacher. Educational research supports the fact that what the teacher does with regard to instruction is critical to the success of the student (Archer, 2002; Noll, 2003).

Failure to link the criteria to achieve highly qualified teacher status with the expectation for use of scientific research-based instructional practices results in a disconnect within the NCLB Act. Moreover, this disconnect reveals a discrepancy between the law and current educational research. Amending legislation with changes that are firmly grounded in educational research increases the likelihood that regulations will include mandates for the use of key components in an effective teaching and learning process. By making achievement of highly qualified teacher status contingent on the use of scientific research-based instructional practices, NCLB would reflect best practices as documented in educational research and would provide a foundation for powerful new legislation that underpins substantive educational reform.

A second disconnect is identified between NCLB mandates and evidence of implementation within schools. The literature, in fact, is silent as to whether the mandates for the use of scientific research-based instructional practices have been implemented. The lack of evidence of implementation in the literature indicates that schools have been slow in embracing the reforms called for in NCLB. More importantly there is a lack of evidence that

NCLB has resulted in substantive change in educational practices with the consequence that the potential for improved student learning has not been realized.

Background of the Study

Educational research provides compelling evidence that the teacher is the most decisive factor in the teaching and learning process (Archer, 2002; Noll, 2003). The literature further confirms that effective teachers demonstrate effective methods of teaching. The following studies provide evidence of teacher importance in the instructional process. Fuller (1999) found that a 1% increase in teacher quality was associated with a 3-5% decrease in the percentage of students failing. Rosenthal (1991) concluded that schools and teachers can have a powerful effect on student achievement. In fact, Rosenthal's research indicated that a teacher can have a powerful effect on students even if the school does not. Furthermore, this study, which analyzed the achievement of more than 100,000 students from hundreds of schools, corroborated the findings from other studies which concluded that the most important factor affecting student achievement is the teacher (Sanders & Horn, 1994; Wright, Horn & Sanders, 1997) regardless of class size, ethnicity, poverty and location (Archer, 2002; Holland, 2001).

Marzano, Pickering, and Pollock (2001) contributed a practical perspective to the work of Rosenthal (1991) and Sanders and Horn (1994) by identifying high-yield instructional strategies from the research based on effective instruction. These categories include: identifying similarities and differences; summarizing and note taking; reinforcing effort and providing recognition; homework and practice; nonlinguistic representation; cooperative learning; setting objectives and providing feedback; generating and testing hypotheses; and cues, questions, and advance organizers (Marzano, Pickering, & Pollock,

2001). Along with the identification of these instructional strategies, Marzano, Pickering, et al. (2001) determined the average effect size of each instructional practice and then translated the effect size for each strategy into an expected percentile point gain for student achievement. More recently, the Northwest Regional Education Laboratory (NWREL) has added to the work of Marzano, Pickering, et al. by identifying two additional high-yield instructional strategies: thematic instruction and technology which includes the use of simulations and games (NWREL, 2005).

In addition to the research of Marzano, Pickering, et al. (2001) studies conducted at the University of Kansas Center for Research on Learning have documented the effectiveness of the *Strategic Instruction Model (SIM)*. The *SIM* is based on four core categories of strategies that are defined by their purpose including: acquisition, storage, expression of competence, and motivation. Each strategy found in the *SIM* is taught in a systematic method with a goal of mastery for each. Results of these studies conducted at the University of Kansas consistently report improved student performance with systematic use of the strategies.

While the inclusion of scientific research-based instructional practices in the school curriculum appears to be an educational gold mine, this mandate lamentably comes at a time when school districts across the nation are facing a shortage of minimally trained teachers, much less an adequate supply of highly qualified teachers. Recruitment and retention of quality teachers becomes a critical task for school districts seeking to provide the scientific research-based educational services mandated in NCLB. Collaborative efforts are underway between state departments of education and teacher education programs at colleges and universities to attract talented students and then provide innovative programs that will

adequately prepare teacher candidates as highly qualified professionals with the competencies necessary to meet the challenges of a teaching career (Holland, 2001; Noll, 2003).

These national efforts, while promising, did little to assist school districts facing the urgency to meet federal standards to provide a highly qualified work force by the end of the 2005-06 school year. NCLB calls for unprecedented change in the standards for teacher qualifications. However, substantive change will not come effortlessly or without cost. A significant investment of educational dollars is necessary to assist teachers with meeting these standards. In fact, some schools report an average cost of $7,700 per teacher per year, nearly 7.8% of the total operating budget, for professional development (Fermanich, 2002). As a result, school districts are turning to professional development opportunities as a timely means to fill the gaps. Working within the constraints of public education budgets, school districts are faced with tightening the agenda for professional development opportunities. Effective professional development is focused on scientific-based practices that are provided within a framework of standards that promote ethical practice and facilitate growth and development of professional skills (Council for Exceptional Children, 2005). In addition, districts must coordinate tailored training that is culturally responsive to, and dynamically matched with, the needs of the population of students in local schools (Newman, King, & Youngs, 2000). Finally, the learning of new skills alone will not produce a positive impact on classroom instruction. In order to get value out of the investment in professional development, districts must take care to structure professional development opportunities in a manner that encourages carry over of newly acquired information and skills into daily classroom practice (Charp, 2003; Guskey, 2002).

Statement of the Problem

Evidence supports the hypothesis that teachers who are certified and knowledgeable in the content area of the teaching assignment are effective in assisting students to meet educational outcomes. In fact, the results of one study (Holland, 2001) documented a correlation between teacher scores on state mandated competency testing and student outcomes. This study revealed that students who were taught for three years by teachers whose test scores were in the low quartile achieved in the 35th to 45th percentile on achievement testing; while students receiving instruction for three years from fourth quartile teachers scored in the 85th to 95th percentile. However, other research reveals an equally significant finding, that the instructional practices employed by the teacher are the most decisive factor in successful student learning (Sanders & Horn, 1994; Wright, et al., 1997) regardless of class size, ethnicity, poverty and location (Archer, 2002; Darling-Hammond, 2000; Holland, 2001). NCLB fails to consider this well-documented finding in the definition of highly qualified teacher. Moreover, little information is available as to whether the initiation of the NCLB requirements for highly qualified status has resulted in substantive change in instructional practices.

The current definition of highly qualified teacher in NCLB requires districts to commit funds to support credentialing of teachers without any assurance that teachers will receive training in the use of high-yield instructional strategies. With the public demand for accountability increasing, education dollars must be spent in the most responsible manner. School districts simply cannot afford to sponsor tuition reimbursement programs, professional development activities or teacher training efforts that produce little impact on student outcomes.

The study examined the extent to which West Virginia public school teachers perceive the importance and use of scientific research-based instructional strategies as identified in the work of the Mid-Continent Regional Educational Laboratory (MCREL) and the extent to which perceived importance and frequency of use of scientific research-based instructional strategies differ between highly qualified teachers and non-highly qualified teachers. The highly qualified status of the teachers was obtained from the 2006-07 database of West Virginia teachers; however, this status was reported during the 2005-06 school year. For this reason, the scope of the study focused on information reported for the 2005-06 school year.

Research Questions

This quantitative study examined the following questions:

1) To what extent do West Virginia teachers perceive scientific research-based instructional strategies important in delivery of school curriculum?

2) To what extent do West Virginia teachers use scientific research-based instructional strategies in delivery of school curriculum?

3) To what extent does perceived importance of scientific research-based instructional strategies differ between highly qualified and non-highly qualified West Virginia teachers?

4) To what extent does use of scientific research-based instructional strategies differ between highly qualified and non-highly qualified West Virginia teachers?

Operational Definitions

The following terms are defined to identify their use within this study:

1) West Virginia Teachers. The term *West Virginia Teachers* refers to a random sample of teachers employed in public schools in the state of West Virginia during the 2005-06 school year as indicated by the West Virginia Education Information System.

2) Highly Qualified Teacher. In this study, a *highly qualified teacher* is identified as a teacher employed in a West Virginia public school who meets the criteria in NCLB or highly qualified status including the following: (1) holds a bachelor's degree, (2) holds full state certification or licensure for the subject(s) of their assignment, and (3) proves knowledge of subject matter content by performance on a rigorous state adopted test.

3) Non-Highly Qualified Teacher. In this study, a *non-highly qualified teacher* is identified as a teacher employed in a West Virginia public school who meets the following criteria: (1) holds a bachelor's degree, and (2) holds a temporary permit for state certification or licensure for the subject or field of their assignment, or (3) meets the criteria set by the state of West Virginia to achieve highly qualified status through the HOUSSE process.

4) Scientifically-based Research. *Scientifically-based research* is defined in NCLB as research that involves the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs.

5) Instructional Strategies. *Instructional strategies* are the general teaching methods and strategies used to facilitate the teaching and learning process within an

educational setting as identified in the research and discussed in the literature review found in Chapter Two.

6) Scientific Research-based Instructional Strategies. As defined in NCLB, s*cientific research-based instructional strategies* are methods and strategies documented by a scientific process describing the quality and merit of the strategies. This documentation includes well-designed randomized controlled trials, pre-post studies, large comparison studies, and meta-analyses of relevant research as identified in the literature review found in Chapter Two of this dissertation.

Significance of the Study

The disconnect within NCLB between highly qualified teacher status and the demonstration of effective scientific research-based instructional strategies was explored to provide lawmakers with the critical facts to amend legislation that is rich, not just in change but also in the substance of that change. Examination of current educational research on the qualities of scientific research-based instructional strategies is essential to this exploration. Refinement of the definition of highly qualified teacher may assist school districts with recruitment, retention and training of teachers who are highly skilled in effective, results-oriented instructional practices.

Results of this study added to the body of knowledge for the extent to which educators are complying with the NCLB regulations to incorporate scientific research-based instructional strategies into the delivery of school curriculum. Furthermore, analysis of data from the study provided insight into the link between highly qualified teacher status and perceived importance and use of high-yield instructional strategies among West Virginia teachers. Ultimately, research that contributes to the body of knowledge for effective

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teaching and learning serves as the underpinnings for future education policies and promotes best practices in our schools. The outcomes also assist school districts with the identification of the critical mixture of credentials and instructional practices that result in improved learning outcomes for students. Additionally, the results of this study have implications for the provision of high quality professional development activities. Finally, the findings of this project inform Congress and state legislators as they exercise their power to authorize educational policies.

Assumptions

The following assumptions were presented to decrease threats to the validity of the study:

1) Survey questions were structured in a format to establish internal validity.

2) Survey questions were reasonably calculated to disengage bias and inform the research questions.

3) Survey questions were clearly constructed affording all participants the same understanding of the intended meaning of the questions.

4) Participants in the study gave adequate effort to responses by engaging in reflective practice to provide information that accurately described their beliefs and experiences.

5) Participants in the study refrained from providing responses based on political stance or personal feelings about NCLB.

6) Data collected were assumed to follow the normal distribution.

Delimitations and Limitations

The following delimitations were identified as factors that limit or prevent generalization of the findings of this study:

1) The sample adequately reflected the population thereby making the results generalizable to public school teachers in the state of West Virginia.

2) The content and scope of this study is limited to teachers in the state of West Virginia. Therefore, the results cannot be generalized to teachers in other states or districts.

3) Data obtained from a Likert scale were converted to numerical values for analyses using independent samples *t*-tests.

The following limitations were identified as possible restrictions in the research method for this study:

1) The study relied on self-reported information through survey; no assurance was given that the participants gave adequate time and thought when completing the survey.

2) Future interpretations of highly qualified teacher and the HOUSSE process as detailed in NCLB may be a threat to relevance of the study as interpretations of NCLB continue to be forthcoming.

3) Survey questions were designed as forced responses relying on a four-point Likert scale which did not provide an opportunity for respondents to elaborate or construct their own responses to increase accuracy of reporting.

Organization of the Remaining Chapters of the Study

The remaining chapters of this study provide the context for investigation of the problem regarding the extent to which educators across the state of West Virginia perceive scientific research-based instructional strategies as important and the frequency of use of scientific research-based instructional strategies in delivery of school curriculum. Chapter

Two provides an analysis and synthesis of current educational literature related to the importance of the use of scientific researched-based instructional strategies in the delivery of school curriculum. A review of change theory is presented as the theoretical framework for the study because NCLB legislation has prompted unprecedented change in the delivery of educational services across the nation. The process of change and the barriers to change are explored as this study provided insight into the question as to whether mandated changes in educational policy have resulted in substantive changes in instructional practices. Anchored to the theoretical concept of change process, the analysis of the literature includes discussion of the newly created field of educational science, scientific research-based instructional strategies, effective schools research, the NCLB legislation, and relevant West Virginia State Board of Education policies. Furthermore, the literature review establishes a foundation for the debate about whether certification alone is adequate for determining the highly qualified status of a teacher, or if instructional practices are also a key component of teacher quality.

Chapter Three of this study describes the research design and method. The population for the study is teachers in West Virginia public schools assigned to teaching positions during the 2005-06 school year. A stratified random sample was obtained from the West Virginia Education Information System, a state-wide database for all school employees. A survey tool, *Instructional Strategies Inventory*, was constructed and disseminated to participants to determine the extent of perceived importance and frequency of use of scientific research-based instructional strategies. (See *Instructional Strategies Inventory*, Appendix A.)

Results of this study are reported in Chapter Four by disaggregating the data into categories based on the status of teachers who are highly qualified or non-highly qualified. Appropriate statistical analyses were applied to determine the difference among the mean

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scores of the groups. Chapter Five provides conclusions as well as discussion of the findings

and recommendations for further study. Finally, appendices are included to provide

supporting documentation including letters, forms, and survey questions used in the study.

CHAPTER TWO: LITERATURE REVIEW

Chapter Two provides analysis of the literature that supports the research questions identifying the need to examine perceived importance and frequency of use of scientific research-based instructional strategies in West Virginia schools. Initially, the literature review focuses on the process of change to establish a theoretical framework for the study. Major reform in the business of education has been prompted by NCLB mandates for a highly qualified workforce, use of scientific research-based instructional strategies, and evidence that all students are progressing in a standards based curriculum, all of which require major reform in the business of education. Lacking in the research, however, is evidence as to whether changes in the NCLB legislation have resulted in substantive change in instructional practices. The results of this study contribute to a better understanding as to the extent to which educators perceive scientific research-based instructional strategies as important and the frequency of use of these strategies among West Virginia teachers. Furthermore, the investigation in this study identified some of the barriers to reform that impede implementation of mandated practices.

As background for the study, the literature review presents a detailed analysis of relevant federal and state education policies which can be assumed to be anchored in effective schools research. This analysis of the policies and the discussion of effective schools research provide a factual base for illustrating the disconnect between the mandate for highly qualified teacher status and the requirement for use of scientific research-based instructional strategies. Moreover, the overview of policies and summary of effective schools research spark the debate between *qualified teacher* vs. *quality teacher* and raise the question as to whether certification alone is an adequate criterion for determining the highly qualified

status of a teacher or if instructional practice is equally important to an effective teaching and learning process.

The core of the literature review presents a discussion of the newly created field of educational science as it relates to scientific research-based instructional strategies. The NCLB website identifies two specific models of instructional strategies that meet the requirements for a scientific research base: the *Strategic Instruction Model*, developed at the University of Kansas Center for Research on Learning, and *Classroom Instruction that Works,* promoted by the Mid-Continent Research Education Laboratory. The strategies for both models are defined within the literature review and data are provided as support for the effectiveness of each strategy.

Finally, a summary of the literature is offered as a rationale for conducting research to examine the extent of use of scientific research-based instructional strategies among West Virginia teachers. This summary identifies the need for educators to embrace current educational literature and policies in making changes in traditional, ineffective educational practices. Moreover, a challenge to engage in decisions based on data and scientific research as a bridge between educational research and daily instructional practices is presented.

Theoretical Framework

The Theory of Change

The 20th century was like 25 years of change at today's rate of change; and the next 25 years we'll make four times the progress you saw in the 20th century. And we'll make 20,000 years of progress in the 21st century, which is almost a thousand times more technical change than we saw in the 20th century. (Kurzweil [as cited in Roemischer, 2002, p. 120]).

As evidenced by this quotation, we are living in an ever-changing fast paced world influenced by increasing volumes of knowledge as well as technological advances. The challenges of keeping up with this pace are exacerbating educational woes. School districts across the nation are facing the reality of unprecedented expectation of accountability including increased standards for teachers to achieve highly qualified status, the expectation that data based decisions drive the use of scientific research-based instructional strategies, and the mandate that all students, regardless of race, disability or socio-economic status, achieve mastery level in language arts, math, and science by the year 2014. Unarguably, these mandates call for major reform in the business of education. The process of change must be examined to determine the barriers to reform that, when removed, will result in bridging educational policy mandates to substantive change in instructional practices.

The Process of Change

A review of the literature related to education reform reveals a significant body of educational research that focuses on the issue of substantive change in the American education system. With the publication of *A Nation at Risk* in 1983, educators and lawmakers were forced to consider major school reform efforts and, in response, reform initiatives have proliferated for nearly three decades (National Commission on Excellence in Education. 1983). However, urgency exists to engage in initiatives that are calculated for success as researchers report that the "process of change appears substantively more complex in the 1990s than in earlier decades, and the costs of failure, in terms of individual development and societal justice, loom high" (Comfort, 1997, p. 259).

Moreover, the focus of educational change has moved from a question of attributes of good teaching and learning that were prevalent in the 1960s to a question of teacher

effectiveness and knowledge of pedagogy of teaching in the 1980s and 1990s. The focus of educational reform for the 21st century appears to be the outcomes, consequences, and results of teacher education with regard to teacher preparation and licensure as well as research agendas related to teacher and student learning (Cochran-Smith, 1997). Researcher Willard Daggett (2005) identifies four areas of consideration as the impetus for educational change: globalization, changing demographics, technology and changing values and attitudes. Daggett passionately petitions educators to respond to this information with urgency in order to maintain America's position as the most powerful nation. Furthermore, Daggett states that the competition with China, Eastern Europe and India are real threats to American status as the top economic leader in the world. In response to this progressive focus, educational leaders must explore the elements of substantive, productive change to determine the critical processes for bridging the focus of change found in educational research to daily classroom practice (Fullan, 2004; Marzano, Waters, & McNulty, 2005).

According to Fullan (2004), common principles can be identified in successful educational reform efforts. Shared moral purpose, capacity building, ongoing learning, and demanding culture are among the crucial components of leadership for substantive educational reform (Fullan, 2004). Marzano, Waters, et al., (2005) refer to the necessity of first order and second order change to achieve substantive educational reform. In first order change, schools begin to make small, incremental changes that may fine tune the system but do not lead to radically different practices. In second order change, the system is reformed in major ways including a dramatic shift in vision and direction which requires innovative and novel ways of thinking and acting. While both first order and second order change are observed in education reform initiatives, first order change occurs more frequently but is

rarely sustained. Second order change occurs more rarely but holds the promise of accomplishing substantive, meaningful reform. The problem is that educational reform requires second order change to address the complex, paralyzing problems in education such as poverty, the achievement gap, failing schools, and racial division.

One constant in the theory of change is recognition of the culture of the organization as a powerful influence in the change process. In fact, according to Schlechty (1990, p. xvi), an organization must be "recultured before it can be restructured." To be meaningful, this reculturing requires significant change in the interaction between teachers and students including major changes in curriculum, instruction, and standards of achievement.

McAdams (1997) describes the first essential step in the change process as the development of vision by motivated individuals who are willing to serve as change agents. In planning for substantive change, change agents must consider structural and political aspects of the organization as well as the assumptions, values, and norms of the organization (McAdams, 1997). Marzano, Waters, et al., (2005) see teachers and individuals in educational leadership as the most powerful change agents while Daggett's prescription for educational change is driven by the political, economic, and social context of contemporary American society (Daggett, 2005).

Barriers to Change

Researchers have well-documented the barriers to educational reform. In fact, Lindblom (1997, p. 265) reports that "initiating change is a competitive, often hostile, activity." This resistance may be due to a variety of factors. Innately, the process of change is energy and time intensive. In fact, Fullan (1991) indicates that change in complex systems may take several years. He concluded that "the total time frame from initiation to

institutionalization is lengthy, [and] even moderately complex changes take from three to five years, while major restructuring efforts can take five to ten years" (Fullan, 1991, p. 49). Based on this premise, Fullan indicates that change in small elementary schools may occur faster than change in large high schools. While Fullan concedes that the very fact that change occurs at all is a welcome finding, he also reports that change occurs in only a small number of schools and reform efforts rarely persist, even in areas where there is a strong adoption and implementation initiative (McAdams, 1997).

In addition to time and energy, Fullan (1991) identifies another major barrier to change in public schools as implementation dip. Implementation dip is "the period of time, early in the implementation process, during which productivity and morale both decline because of the tensions and anxieties generated as educators, parents, and students attempt to deal with unanticipated problems" (McAdams, 1997, p. 140). Unfortunately, implementation dip often coincides with the political demands for accountability and expectations for quick results. This untimely merging of factors has led to the defeat of many promising reform efforts.

Finally, impending change is often viewed as a threat to the vitality of the organizational culture leading to resistance to the change itself. Teachers perceive curriculum and instruction as the heart of their existence and traditionally teachers have been empowered to make autonomous decisions regarding the teaching and learning process. As a result, teachers view changes to curriculum and instruction as a threat to their autonomy and, regardless of the worthy goal of educational reform efforts, teachers resist turning over control of decisions for instruction to federal and state legislatures as well as superintendents and county boards. Furthermore, school districts often fail to invest the time and resources

into professional development opportunities that may serve to build trust between educational leaders and teachers and minimize teachers' fear of losing autonomy (McAdams, 1997).

According to Fullan (2000), failure to understand the importance of local school development and the quality of the surrounding infrastructure often results in derailment of educational reform initiatives. Fullan describes the necessary underpinnings of long-lasting substantive change by referencing the following essential components of change: "The first is the 'inside story,' what we know about how schools change for the better in terms of their internal dynamics. The second is the 'inside-outside' story, what effective schools do as they contemplate the plethora of outside forces impinging on them. The third is the 'outside-in' story, how agencies external to the school organize themselves to be effective in accomplishing large-scale reform at the school level. Taken together, these three stories provide a powerful and compelling framework for accomplishing education reform on a scale never before seen" (Fullan, 2000, p. 581).

Summary of Change Theory

While public institutions bear a major responsibility for understanding the demands for change and facilitating the process to achieve substantive change, reform in well-engrained educational practices will not come easily (Comfort, 1997). Lindblom (1997) describing the current state of public education reform in the following summary remarks to an audience at the Wherett Lecture Series:

> …that change is resisted, often more successfully than it is initiated; that it often comes out distorted; that it is sometimes impossible; that its opponents are many and powerful, even if they are sometimes defeated; that initiating change is not a tidy

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intellectual exercise but a profound struggle; that the fundamental barrier to change is systematically impaired minds; that these minds are not the consequence of accident or our apathy but the practices, some deliberate, some not, of the advantaged, whose struggle to resist disadvantaging change has no more effective method than to impair all of us. (p. 270)

Educational leaders must engage in practices that facilitate the change process if an adequate supply of highly qualified teachers is to be available to educate the youth of America. Professional development plays a critical role in achieving the goal of facilitating a shift from traditional teaching practices to more effective, efficient classroom practices (Charp, 2003; Newman, King, & Youngs, 2000). As school districts seek to provide quality educational services, the provision of effective, efficient professional development becomes paramount in training and retaining highly qualified teachers to incorporate the use of scientific-based strategies into daily classroom practice.

Overview of Legislative Policies

Federal Legislation

Historically, the U.S. Constitution delegates the operation of education systems to each state under the 10th Amendment which indicates that the "powers not delegated to the United States by the Constitution, nor prohibited by it to the states, are reserved to the states respectively" (Essex, 2005, p. 2). However, increases in federal funding of public education and a public demand for accountability have sparked Congress to assume an increasingly aggressive role in framing federal laws to regulate education. In fact, the congressional role in public education has reached an unprecedented height during the last three decades (Parrish, 1996). The controversial No Child Left Behind Act of 2001 and the recently

reauthorized Individuals with Disabilities Education Improvement Act of 2004 outline

requirements for quality education across America.

No Child Left Behind Act of 2001

The most recent reauthorization of the Elementary and Secondary Education Act,

Public Law 107-110, better known as the No Child Left Behind (NCLB) Act of 2001,

mandates significant increases in accountability for the preparation and on-going professional

development for both general and special education teachers. In addition, NCLB requires that

teachers incorporate scientific research-based instructional strategies into the classroom. This

legislation defines scientifically-based research as research that involves the application of

rigorous, systematic and objective procedures to obtain reliable and valid knowledge relevant

to education activities and programs (U.S. Department of Education, 2005).

The No Child Left Behind Act of 2001 requires school systems across America to

employ a highly qualified work force to use scientific research-based practices to insure

successful student outcomes. Title I of NCLB, Improving the Academic Achievement of the

Disadvantaged, includes the purpose and provision of "promoting schoolwide reform and

ensuring the access of children to effective, scientifically-based instructional strategies and

challenging academic content" (U.S. Department of Education, 2005, p. 16). No Child Left

Behind focuses on what works in instruction by placing a special emphasis on implementing

education programs and practices that have clearly demonstrated effectiveness through

rigorous scientific research. Federal funding is targeted to support programs that consistently

demonstrate effectiveness. For example, the *Reading First* program makes federal funds

available to states to help reading teachers in the early grades strengthen existing skills and

gain new ones in effective, scientifically based instructional techniques. To increase

awareness and assess the quality of specific studies of the effectiveness of education interventions such as *Reading First*, the U.S. Department of Education has created the *What Works Clearinghouse* as well as the NCLB *Toolkit for Teachers* as resources to school districts.

With the passage of the NCLB Act, school districts were immediately required to ensure that all teachers hired after the enactment would be highly qualified and to commit that all teachers employed before passage of NCLB would meet the definition of highly qualified by the end of the 2005-06 school year. To meet the definition of highly qualified, teachers new to the profession within the last two years must have earned at least a bachelor's degree and hold full state certification with no waivers for licensure on an emergency, temporary or provisional basis. In addition, teachers are required to pass a rigorous test adopted by the state to demonstrate subject knowledge. Elementary teachers must demonstrate skills in reading, writing, mathematics, and other areas of the basic elementary school curriculum and middle or secondary teachers must demonstrate a high level of competency in each of the academic subjects in which the teacher is assigned to teach. In addition, middle and secondary educators are required to hold advanced certification or credentialing in the academic subjects in which they teach.

NCLB provides some flexibility for veteran teachers who are not new to the profession to meet the standards for highly qualified professionals. In addition to the requirement that all teachers hold a minimum of a bachelor's degree, experienced teachers may demonstrate competency based on a High Objective Uniform State Standard Evaluation (HOUSSE). The HOUSSE is determined by the state for each grade appropriate academic subject and must be aligned with the challenging state academic content standards for

students. In addition the HOUSSE process must document objective, coherent information about the teacher's knowledge of the core academic subjects in which a teacher is assigned to teach (U.S. Department of Education, 2005). The U.S. Department of Education offers technical assistance to states for the development of the HOUSSE process by providing the NCLB *Toolkit for Teachers*. This resource provides examples of various HOUSSE programs that incorporate a point system to allow teachers to count a combination of experiences such as years of successful classroom experience, participation in high-quality professional development, service on curriculum-development teams, and other activities related to the development of core academic content (Council for Exceptional Children, 2005).

Individuals with Disabilities Education Improvement Act of 2004

A side by side comparison of the Individuals with Disabilities Education Improvement Act (IDEA) 2004 and NCLB reveals that IDEA 2004 holds to the same criteria as found in NCLB for special educators and paraprofessionals to achieve and maintain highly qualified status. Specifically, a special education teacher who is responsible for providing instruction and course credit for any course included in the NCLB-defined core academic subject areas for students with disabilities must meet state certification requirements in order to be considered highly qualified. If a special education teacher does not hold the appropriate content specialization, the teacher must collaborate in the planning and delivery of instruction with a teacher who holds the appropriate content specialization.

These practices required by NCLB and IDEA 2004 are intended to improve the teaching and learning process in our schools and mandate unprecedented requirement that special and general educators engage in collaborative practices to improve learning outcomes for all students (Council for Exceptional Children, 2005). The IDEA 2004 and NCLB require

state education agencies to provide evidence of annual increases in the percentage of teachers and paraprofessionals who are receiving high-quality professional development leading to highly qualified status. Flexibility is given to state agencies to determine both traditional certification routes and alternate standards for meeting highly qualified requirements of the NCLB (U.S. Department of Education, 2005; West Virginia Board of Education Policy 5202, 2005).

West Virginia State Legislative Policies

In response to federal legislation which frames requirements for our nation's education system, state education agencies are charged with the responsibility of creating policies to direct and guide school districts within the state as they provide educational programs (West Virginia Board of Education Policy 5202, 2005). To no surprise, increases in federal expectations have led to an increase in state requirements for higher standards in teaching and learning as well as teacher preparation and teacher certification programs. The following information provides an overview of West Virginia Board of Education Policies that govern expectations for quality education, content standards, and preparation and certification of public school personnel.

West Virginia Board of Education Policy 2510

Policy 2510, Assuring the Quality of Education: Regulations for Education Programs, establishes regulations for education improvements related to teaching and learning. In addition this statute ensures equal education opportunities for all students. These opportunities include access to high quality programs of study, high quality administrative and instructional practices effective instructional strategies, work-based experiences, support programs, personnel, instructional materials, supplies, equipment, technology integration,

and facilities as well as reliable assessment measures. Policy 2510 assures a thorough and efficient system for management of these resources as well as a commitment to working with parents, educators, communities, business, industry, and higher education to improve services. This policy stresses the importance of local boards of education, the school, community, students and families of students working cooperatively to establish high expectations for student performance and become actively involved in the education process, thereby enabling students to succeed in the classroom and the workplace, lead rewarding and productive lives, and participate responsibly in society (West Virginia Board of Education Policy 2510, 2005).

West Virginia Board of Education Policy 2520

Policy 2520, Content Standards and Objectives for West Virginia Schools, defines the content standards and objectives for the programs of study mandated in Policy 2510. This policy provides a focus for teachers to teach and students to learn those skills and competencies essential for future success in the workplace and further education. Included are reading and English language arts, mathematics, social studies, science, health, dance, music, theatre, visual arts, geography, foreign languages, driver education, physical education, and early learning standards. Also included are program charts for K-12 instructional practices and explanation of terms. Theses standards and objectives are proposed as rigorous and challenging curriculum, process/workplace objectives and computer/technology objectives (West Virginia Board of Education Policy 2520, 2003).

West Virginia Board of Education Policy 5100

In the state of West Virginia, the West Virginia Board of Education is charged with the responsibility of determining standards for teacher preparation programs. West Virginia

Board of Education Policy 5100, Approval of Educational Personnel Preparation Programs, establishes the process for institutions of higher education to follow in development, approval, and implementation of professional education programs leading to West Virginia licensure. Divided into nineteen sections, Policy 5100 defines requirements for program admission, and retention and exit criteria as well as major program components for teacher education programs. Additionally, assessment instruments and procedures are identified and minimum proficiency levels for performance on assessment are established.

Specifically, the purpose of West Virginia Board of Education Policy 5100 is to establish a collaborative process for program approval that leads to improvement in educational personnel preparation programs to ensure that professional educators in public schools have adequate skills to enter the profession. Furthermore, this policy requires that higher education institutions develop written collaborative agreements with the public schools to provide professional preparation experiences that are best practice and research-based and that result in increased student achievement (West Virginia Board of Education Policy 5100, 2005).

West Virginia Board of Education Policy 5202 and Policy 5203

West Virginia Board of Education Policy 5202, Minimum Requirements for the Licensure of Professional/Paraprofessional Personnel and Advanced Salary Classifications, and West Virginia Board of Education Policy 5203, National Board for Professional Teaching Standards Certification Reimbursement/Salary Bonus Program, have recently been combined to form West Virginia Board of Education Policy 5202. These regulations outline the minimum requirements for the various licenses approved by the West Virginia Board of Education, to educators and paraprofessionals who wish to work in West Virginia's public

schools. According to Policy 5202, the primary purpose of state licensure is to assure the public that educators and paraprofessionals meet competency levels to deliver effective educational programs to students attending West Virginia public schools. Identified categories of licenses including the following: Professional Certificate; Alternative Teaching Certificate; Temporary Certificate; Career/Technical Education Certificate; Temporary Career/Technical Education Certificate; Permit; Authorization, and Paraprofessional Certificate.

Conditions for meeting highly qualified teacher status are described in Section 8 of Policy 5202. At the beginning of the 2002-2003 school year, all teachers and paraprofessionals newly hired in Title I schools were required to meet the federal definition of highly qualified as stated in the reauthorization of the Elementary and Secondary Education Act, otherwise known as the No Child Left Behind (NCLB) Act of 2001. By the end of the 2005-2006 school year, all teachers delivering instruction in the core academic subject areas must meet the NCLB definition of highly qualified teacher. In accordance with the federal law, West Virginia policy defines a highly qualified teacher as one who has earned a bachelors degree or higher and meets the state certification requirements whether by traditional programs or through alternative routes to certification and holds an endorsement in the core academic subject being taught. Core academic subjects include the following: the arts including dance, music, theatre, and visual art; reading/language arts; English; foreign language; mathematics; science; civics and government; economics; geography; and history. In addition the teacher must demonstrate subject matter competency by obtaining the minimum acceptable score on the state competency test in the content areas or by earning a minimum of 21 college credits or advanced credentials in the academic major in the subject

taught. Teachers who do not meet these requirements may choose to demonstrate the skills necessary to be considered highly qualified by satisfying West Virginia's HOUSSE process.

In agreement with guidelines established in NCLB, Policy 5202 states that a special education teacher who provides instruction and course credit for core academic subject areas for students with exceptionalities must hold a minimum of a bachelor's degree, meet state certification requirements with the appropriate endorsement in special education, and demonstrate subject matter competency in order to be considered highly qualified. If a special educator does not hold the necessary content specialization, the teacher must collaborate in the planning and delivery of instruction with a teacher who holds the required content specialization. To comply with the law, collaboration must be ongoing and involve two or more teachers working together toward a common goal. Collaboration activities may include, but are not limited to: setting instructional goals, identifying learning problems, assessing students' needs and skills, exchanging information about student work and effective instructional strategies, and planning and delivering instruction and evaluating its impact on student progress. Collaboration may also include co-teaching, planning together over the school year, and conferencing on a scheduled basis to adjust and improve instruction. A special educator who holds certification in the area of disabilities of the students being taught and who works in a collaborative role with a highly qualified general education teacher is considered highly qualified (US Department of Education, 2005; West Virginia Board of Education Policy 5202, 2005).

In accordance with Policy 5100, Policy 5202 requires applicants for a professional teaching license to complete a clinical Practice/Field-Based Experience. This experience must be a minimum of twelve weeks and may be extended if more time is needed for the

candidate to demonstration the proficiency level. The candidate must be assessed during the clinical experience in at least one specialization for which licensure is being requested and for diverse, at risk, and special needs learners at each program level for which licensure is desired (West Virginia Board of Education Policy 5202, 2005).

West Virginia Board of Education Policy 2419

Finally, in response to federal laws guiding the education for students with disabilities, West Virginia Department of Education Policy 2419, Regulations for the Education of Exceptional Students, provides guidance to county school systems on the administration and provision of special education services. A close inspection of Policy 2419 reveals identical requirements to the federally supported IDEA 2004 with regard to teacher qualifications and accountability for all students to make progress in the general curriculum. Policy 2419 requires each local education agency (LEA) within the state of West Virginia to develop regulations that align with Policy 2419; however, the LEA may add more specific requirements pending approval of the West Virginia Board of Education (West Virginia Board of Education Policy 2419, 2002).

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Effective Schools Research

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Mandates found in the text of federal and state policies are rooted within the basic tenets of effective schools research conducted and published over the past two decades. The requirements found in the NCLB Act are no exception. The extensive body of effective schools research has maintained an intense focus on educational practices that lead to improvement in student achievement and underpins the educational reform effort commonly referred to as the effective schools movement. Researchers Edmonds and Fredrickson (1979) are credited with the discovery of six correlates or characteristics that were determined to be

common to schools that were considered effective regardless of their populations of students from minority or low socioeconomic backgrounds. The original six correlates of effective schools include the following: 1) strong administrative leadership; 2) a belief that no students including students of poverty will be permitted to fall below the minimum levels of achievement; 3) a school atmosphere that is conducive to learning, orderly but not rigid, quiet but not oppressive; 4) a clear understanding that student acquisition of basic school skills takes precedence over all other school activities; 5) a business practice that permits school energy and resources to be diverted from other business areas to areas that support the fundamental objectives; and 6) frequent monitoring of student progress which may include classroom testing or system-wide standardized measures.

As a result of the work of other researchers such as Wilbur Brookover, Larry Lezotte, John Frederickson, George Weber, Matthew Miles, Daniel Levine and Eugene Eubanks, the body of effective schools research continued to expand into the 1980s. Early in the 1980s effective school research yielded empirical evidence that supported the belief that all students can learn. This finding did not go unnoticed by the U.S. Department of Education. Secretary of Education William Bennett embraced the findings of effective schools research and used the information to establish a common language for school reform which includes vocabulary such as "high expectations" for "teaching all children to achieve state and local standards" so that they will be "successful at the next grade level" by implementing school and classroom changes to include "strategies that address school and district mission statements" and "data-guided decision making" with a focus on "what works" (Taylor, 2002, p. 375). Moreover, as a result of the national attention, the original six correlates were amended to include additional research findings. The following characteristics of effective schools were added:

1) clearly stated and focused school mission; 2) safe and orderly climate for learning; 3) high expectations for students, teachers, and administrators; 4) opportunity to learn and student time-on-task; 5) instructional leadership by all administrators and staff members; 6) frequent monitoring of student progress; and 7) positive home/school relations. Currently, these correlates are supported by the National Alliance for Effective Schools (NAES) as well as Phi Delta Kappa as the framework for building an effective school (Taylor, 2002).

More recently, the focus of effective schools research has been directed to issues of school leadership. Reform in the traditional management practices within the American economic arena has called attention to the process for improvement including application of new technologies, improvement of the workplace environment, and the use of interactive electronic marketing systems as tools for competition in a rapidly changing world (Winkleman, et al., 1993). Effective schools researcher, Larry Lezotte, recognized what he describes as a striking kinship between the effective schools correlates and the work of economist W. Edwards Deming which focuses on total quality management within an organization. Believing that an effective school is "one that can demonstrate in outcome terms . . . the increasing presence of equity and quality" (Lezotte, 1992, p. 6-7), Lezotte capitalized on his belief by developing a blueprint for the total quality effective school.

In this blueprint Lezotte marries the effective schools correlates with Deming's 14 points for management, establishing practices for the total quality effective school. A side by side description of these principles is found in Table 1. Furthermore, Lezotte suggests that a variety of specialized tools is needed to implement the blueprint for total quality effective schools. These tools include: designing schools to ensure learning and judging school performance by student learning; viewing districts as K-12 entities with a coordinated

sequenced curriculum; recognizing the need for effort and performance; understanding

learning as a social as well as psychological process and engaging the student in active rather

than passive classroom activities; abandoning the age-grade configuration in favor of

appropriate achievement centered settings; believing that students tend to come to school

motivated to learn and learn the things they are taught; and recognizing that today's students

tend to be information rich but experience poor (Lezotte, 1992).

Table 1

A Comparison of Deming's Points for Management and Lezotte's Effective Schools Correlates

Deming's Points for Management	Lezotte's Effective Schools Correlates
Create constancy of purpose toward improvement of product and service	Embrace a belief that all students can learn and that learning is observed in the outcome of the process
Adopt the new philosophy that states that commonly accepted levels of mistakes, delays and defects will no longer be tolerated	Abandon policies, procedures and practices that aren't working and install those that are known to be effective Assume responsibility for students learning the intended curriculum
Cease dependence on mass inspection	Require statistical evidence that quality is built in Engage in frequent monitoring of student learning Use data to monitor attributes of quality schools, instruction, and student achievement Based on the data, develop high quality programs that ensure the success for all students
End the practice of awarding business on the basis of price tag alone	Ensure quality as the goal regardless of competing factors such as class size or socioeconomic level of students Foster the practice of teachers taking responsibility for assuring that students master the knowledge and skills that are essential prerequisites for success at the next level of schooling Frontload success by providing successful early intervention school experiences
Improve constantly and forever the system of production and service	Engage in an aggressive restructuring of the roles of central office management teams and school leadership to re-invent the school as a place that assures learning
Institute modern methods of training on the job	Invest in unprecedented levels of staff development to ensure that staff knows what they are to do to improve student performance
Adopt and institute leadership and get leaders to take responsibility for quality	Engage in effective school leadership that focuses on substantial instructional improvement by establishing new cultural norms that strive for personal competence, increased openness, collaboration and peer

Drive out fear so that everyone may work effectively for the organization	Replace arbitrary and unreliable evaluation that foster fear and destroy the human spirit and desire to learn with policies that policies to that encourage staff to take risks and try new approaches to their work without fear of penalty
Break down barriers between departments	Change the sociological make up of schools by embracing decentralization, site-based management and teacher empowerment which promotes a collective effort to improve the quality of school programs
Eliminate posters and slogans that ask staff for new levels of productivity without providing new methods	Develop a thoughtful mission statement that creates a sustained sense of mission in the school Engage in a collaborative process to develop a school plan that specifies the aims and goals of the school and identifies improvement areas for the coming year Focus major attention on the training, technical assistance and support they will need to truly change professional practices in the school
Eliminate numerical quotas for the work force	Expect teachers to adjust their classroom routines based on the research to meet the need of students as they strive to master the intended curriculum Refrain from setting goals that encompass a numerical value (i.e., a 5 point gain in math scores) as this process often undermines school improvement as the goal is often arbitrary and is considered as the ceiling rather than the base for improvement
Remove barriers that rob people of pride of workmanship. Eliminate the annual rating or merit system	Adopt assessment systems that are standardized, locally generated, curriculum based, and criterion referenced Redesign teacher evaluation systems to focus on teacher efficacy regarding their work and to promote professional growth toward improved school quality
Institute a vigorous program of education and self-improvement for everyone	Invest in professional development and organizational development that changes the level of teacher involvement in decision making and problem solving
Put everybody in the company to work to accomplish the transformation	Change the role of school leadership from that of compliance monitor to that of servant and insist that learning needs of children and the instructional needs of teacher be met in order to reap high quality results

Note. From "Creating the total quality effective school," by L. Lezotte, 1992. Okemos, Michigan: Effective Schools Products, Ltd.

Critics of the effective schools movement charge that, while effective schools research has yielded information about classroom and school characteristics associated with educational success, effective schools studies are questionable with regard to instructional methods, practical implementation, and conceptual factors. First, review of these studies reveals that aggregated student achievement test scores have typically been the measure for

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determining the relationship between school characteristics and school effectiveness (Griffith, 2003). Statistically the size of the effect of these measures has been relatively small (Griffith, 2003; Reynolds & Packer, 1992). In addition, the study designs of effective schools research establish evidence of a correlation but do not provide evidence as to whether the identified characteristics of effective schools are actually the factors that lead to improvement in student achievement.

Next, within effective schools research, practical concerns surface relating to the use of identified attributes as the impetus for schools to become more effective. The research implies that for a school to become more effective, the identified attributes must simply be replicated. This belief contributes to an unrealistic one-size-fits-all approach to school effectiveness (Griffith, 2003). While the process for establishing effective schools may be simple, the work is not easy and is ever-changing and never-ending (Lezotte, 1992).

Finally, critics assert that, while the identification of attributes of effective schools has been useful to the dialogue of school reform, a pervasive attitude of complacency with regard to the correlates of effective schools is observed. Critics assert that ready acceptance of these correlates may be premature as effective schools research lacks an overall organizational framework that completes the bridge from research and theory to daily practice. To assist in completing this connection, effective schools research must identify groupings of attributes of effective schools and establish a context to provide meaning to these groupings (Darling-Hammond, 1997; Griffith, 2003). By developing such a framework, findings from educational research studies have the potential to reveal the extent to which attributes are interrelated, interdependent, result from underlying mechanisms, and operate

differently across contexts, thus increasing the likelihood that the attributes of effectiveness are transferred into daily classroom practice (Griffith, 2003).

Qualified Teacher vs. Quality Teacher—The Debate

Implementation of the No Child Left Behind Act of 2001 has prompted school districts across the nation to engage in innovative approaches to meet the unprecedented expectations of accountability including increased standards for teachers to achieve highly qualified status. According to NCLB, highly qualified teachers are those who hold a bachelor's degree, are granted full state certification or licensure, and have proven that they know subject content for each subject they teach (U.S. Department of Education, 2005). While this definition details the requirements for a teacher to become fully qualified or credentialed, the definition fails to address the issue of teacher quality. Failure to marry the criteria for highly qualified status to the attributes of a high quality teacher results in a disconnect within the NCLB legislation. This disconnect leads to the clear assumption that highly qualified teachers are somehow automatically high quality teachers.

Educational literature provides an argument for both sides of the debate, highly qualified teachers vs. high quality teachers. The following review of the literature details relevant information related to the process of achieving highly qualified status including historical information outlining the need to reform teacher preparation programs. Currently, the support in the literature is limited to the investigation of teacher quality for educators who have been certified through traditional and alternative routes; at this time, research is not available as to the quality of teaching that results from situations where teachers obtain certification through the HOUSSE process as identified in NCLB. Finally, a summary is provided to reconcile the debate concerning highly qualified teacher and high quality teacher.

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Qualified Teacher

As stated earlier, NCLB relies exclusively on credentials to define a highly qualified teacher explicitly stating that to be deemed highly qualified, teachers must have: 1) a bachelor's degree, 2) full state certification or licensure, and 3) prove that they know each subject they teach. Currently, all teachers in schools receiving Title I funds must achieve highly qualified status by the end of the 2005-06 school year; however in a policy letter issued to the Chief State Education Officers dated October 21, 2005, U.S. Deputy Education Secretary Margaret Spellings describes efforts that may allow for a reprieve from the strict deadline. States that will not meet the timeline for all teachers to become highly qualified before the end of the 2005-06 school year were permitted to file a plan for meeting the goal before the end of the 2006-07 school year. The plan will be judged on the good faith effort of the state to train, recruit, and retain a highly qualified work force. Only states failing to make a good faith effort will be subject to withholding of federal funds (U.S. Department of Education, 2005).

This flexibility in the timeline for providing a highly qualified workforce comes as a welcome relief to school districts across the nation; not only are the rigorous requirements to achieve highly qualified status a barrier to compliance with NCLB, but shrinking numbers of teachers available to teach our children is daunting. In fact, some rural and inner city schools are currently experiencing a critical shortage of teachers in fields such as math, science, foreign language and special education (Gewertz, 2002). The National Center for Education Statistics predicts that, if current conditions are maintained, public education will need two million teachers by 2008 to meet the demand (Feistritzer, 2003).

In response to this demand, colleges and universities are being challenged to develop effective teacher education programs that will produce adequate numbers of highly qualified teachers in record time. Moreover, teacher education programs are under pressure to train teachers in the scientific research-based strategies that directly influence the success of the students. While some argue that reform of formal teacher preparation has become more essential as demands increase for teachers to meet the mandates of the law as well as the needs of a diverse student population, others express satisfaction with more flexible alternative certification paths that have surfaced in response to the demand for qualified teachers. Regardless of whether one advocates for traditional or alternative routes to teacher certification, the need for formal teacher preparation is well-documented in educational literature (Darling-Hammond, 1998).

In spite of the need for major reform in teacher preparation programs, educational literature supports the idea that formal teacher preparation is critical to the production of effective teachers. One study conducted in a Texas school district found that scores on teacher licensing exams, teaching knowledge, level of degree and experience accounted for more variability in student achievement than socioeconomic status (Ferguson, 1991). Another study completed in California by the Los Angeles County Office of Education found a strong positive relationship to the reading achievement of elementary students and the percentage of fully certified teachers (Darling-Hammond, 2000; Gewertz, 2002). In fact, in all fields including science, math, vocational education, reading, and elementary education, students who were taught by traditionally certified teachers scored higher in demonstration of higher order thinking and problem solving than students taught by teachers who were alternatively trained (Darling-Hammond, 2000). Fredrick M. Hess (as cited in Noll, 2003)

asserted in his work, Break the Link in *Education Next,* that if teachers have not completed

formal training, they are not qualified to teach regardless of knowledge or expertise.

Although controversial, evidence also exists in the literature to support the benefits of

teacher preparation through alternative routes. In fact, NCLB requires states to develop

alternative teacher programs in an effort to address the shortage of qualified teachers

(U.S. Department of Education, 2005). In the early 1990s Wendy Kopp founded Teach for

America, a shortcut teacher training program designed to recruit bright, dedicated teacher

candidates to teach in disadvantaged schools. In 1998, the National Center for Education

Information published *Alternative Teacher Certification—An Overview* documenting the

growth in alternative teacher certification programs. In 2001, Wendy Kopp once again

contributed to the research on alternative routes to teacher certification by writing a self-

evaluation of her work, *One Day All Children…The unlikely Triumph of Teach for America*

and *What I Learned Along the Way*. The promise of alternative pathways to teacher

certification continues to grow with regular updates on teacher education reform such as

Gary Rubinstein's *Teacher Boot Camp* (Noll, 2003) and NCEI president C. Emily

Feistritzer's *Alternative Routes to Teaching* recently published in *Education Week*

(Feistritzer, 2003; Rubinstein, 2003).

Quality Teacher

While a significant body of research supports the value of qualified, certified teachers

in achieving positive outcomes for students, an equally substantial body of evidence supports

the need for quality teaching. In fact, studies indicate that knowing subject matter alone is

curvilinear rendering an initial positive effect but then stagnating (Darling-Hammond, 2000).

Teacher quality is one of, if not the most, significant factor in student's achievement and

educational improvement (Cochran-Smith, 2004). Research shows that teacher effectiveness, regardless of class size, ethnicity, poverty and location is the critical influence in student learning (Archer, 2002). In fact, some studies indicate that the teacher is the most decisive factor in the teaching and learning process (Darling-Hammond, 1998).

Several studies provide evidence of the link between effective teaching and student learning. Some of the most noted examples of the effects of teacher quality can be found in the 90/90/90 schools. Schools that earn this title are characterized by their populations: 90% of students qualify for a subsidized lunch, more than 90% of students are ethnic minorities, and more than 90% of students meet high academic standards according to independently conducted tests of academic achievement. Douglas B. Reeves (2000), author of *Accountability in Action: A Blueprint for Learning Organizations*, reports that the results of the study of these schools provide enormous evidence that students can meet high standards when provided with critical support for learning. Furthermore, the Center for Performance Assessment (2005) has conducted intensive studies of the 90/90/90 schools and as a result has confirmed the positive relationship between quality teaching and student achievement.

The research on 90/90/90 schools has supplied the underpinnings for Policy Brief No. 12 submitted by the American Federation of Teachers. This report, *Doing What Works: Improving Big City School Districts*, identifies the following critical practices for improving school performance: 1) putting high standards in place; 2) implementing programs that are proven with a research base; 3) improving professional development; 4) reducing class size particularly at the lower grades; 5) providing extra help for students; 6) ensuring safe and orderly schools; and 7) working together with a focus on the common goal of improving student achievement. While more research is needed to determine the effects of the use of

these strategies in a wide array of schools, these practices appear promising. Through a cooperative effort to improve teacher quality by doing what works, teachers, school leaders, communities and families are making a difference in improving school (O'Day & Smith, 1993).

Other research in support of teacher quality includes the work of statistician William Sanders at the University of Tennessee. Utilizing statistical formulas to factor out demographic variables such as class size, race, or socioeconomic status, Sanders has developed a value-added assessment to document the importance of quality teachers in obtaining successful student outcomes in the classroom (Holland, 2001). Tools such as value-added assessment may prove revolutionary in school reform. Sanders' research on No Excuses Schools provides powerful evidence that teachers make the difference in learning. In 1999, the Thomas B. Fordham Foundation affirmed the necessity of results-based accountability systems by publicly supporting Sanders' value-added approach. Additionally, the Fact Heritage Foundation Project determined that in No Excuses Schools in high poverty areas, the quality of teaching was the most important factor (Noll, 2003).

Another example of the positive effect of committed teachers is found at the Frederick Douglas Academy, a public school in Central Harlem with a 99% minority population that ranks in the top ten schools in New York City. The New York Times reports 96% of the students pass math regents exams and 100% of the students pass English even though the classes contained 30-34 students each (Holland, 2001). Still another study (Fuller, 1999) reported that a 1% increase in teacher quality was associated with a 3-5% decline in the percentage of students failing. If the teacher is ineffective, students under the teacher's

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tutelage will show inadequate progress academically regardless of how similar or different they are regarding their academic achievement (Wright et al., 1997).

Cohen and Hill (2000) further refine these findings by adding that student achievement can be attributed to professional development that concentrates on teacher knowledge of specific curriculum reforms. Kennedy (1998) reports that professional development concentrating on subject matter content is perceived as more effective than training that concentrates on more general teaching skills. Arkansas, Illinois, and Nebraska have established teacher quality task forces to make recommendations for recruiting and maintaining quality teachers (Gehring & Reid, 2001).

The Field of Educational Science

Mandates in the federally supported No Child Left Behind (NCLB) Act of 2001 require educators to engage in not only the art of teaching but also the science of teaching. Specifically, the law requires educators to use data to make decisions concerning the delivery of curriculum to students across our nation. No longer can teachers teach in the traditional lecture-read-write format (NWREL, 2005); the advent of NCLB requires that teachers use instructional practices that have been proven to have a scientific research base to document their effectiveness with all students (U.S. Department of Education, 2005). As evidenced by the work of Skinner, Dewey, and others, the field of educational research has not been entirely devoid of the influence of science; however, interest in evidence-based instructional practices has been heightened as a result of the mandates in education policy as well as public outcry for accountability.

This intense interest has led to creation of a new field of research known as educational science. The federally supported Education Sciences Reform Act of 2002 was

created with the expressed purpose of providing for improvement of education research, statistics, evaluation, information, and dissemination. This Act provides information for researchers, educators, school administrators, and citizens related to the field of educational science (U.S. Department of Education, 2006a). The *What Works Clearinghouse* (*WWC*) was established in 2002 by the U.S. Department of Education's Institute of Education Sciences (IES) to provide educators, policymakers, researchers, and the public with a central and trusted source of scientific evidence of what works in education (U.S. Department of Education, 2006c).

As with other fields of science, educational science relies on two widely accepted scientific premises: inquiry, the process of questioning; and method, the process for exploration (Odom et al., 2005; Reyna, 2002). The first premise, inquiry, may be categorized into three specific types: (a) description, to address the question of what is happening; (b) cause, to consider if there is a systematic effect; and (c) process or mechanism, to explore why or how something is happening (Odom et al., 2005). Furthermore, the nature of the inquiry must have significance or a relevance to core issues of the teaching and learning process. As well, the inquiry must be empirically established providing the ability to directly observe the issues. Finally, inquiry is strengthened by its relationship to existing theory. Theory provides an organizational framework for the concept of the inquiry. To be considered quality scientific investigation, results of the inquiry must be related to a conceptual idea such as how children best learn or how instructional practices link to better outcomes for students (Reyna, 2002). Regardless of the nature of the inquiry, determining the relevant questions to ask is the key to an effective process (Odom et al., 2005; Reyna, 2002).

Method, the second premise of educational science, involves the use of empirical and rigorous processes to address the question. The American Speech-Language-Hearing Association proposes the following levels of method to address the quality of the scientific design: (a) Level I—Evidence derived from meta-analyses including at least one randomized experimental design or well-designed randomized control studies; (b) Level II—Evidence includes controlled studies without randomization and quasi-experimental designs; (c) Level III--Consists of well designed non-experimental studies (i.e., correlational and case studies); (d) Level IV--Includes expert committee report, consensus conference, and clinical experience of respected authorities.

Regardless of the level of method, quality scientific research is based upon a dynamic match between the question and method selected for the exploration (Odom et al., 2005).

The purpose of scientific research is to address the gap between research and practice (Odom et al., 2005). By requiring the use of scientific-based research instructional strategies, the federally supported NCLB Act has forced educators to turn to the field of science to establish a research base for instructional practices that lead to improved outcomes for students (Reyna, 2002). Choosing high quality methods and matching the methods to the specific research questions establishes scientific evidence for effective educational practices and helps educators to address the research-to-practice challenge (Odom et al., 2005; Reyna, 2002).

The NCLB website asserts that evidence based education must be high quality scientific research that answers the question of the degree to which the design, analysis, and logical inference support the claims and conclusions. In addition, high quality scientific research establishes relevance by determining to what degree the variables and circumstances

are similar across the research as well as the settings in which the research is to be applied.

Moreover, high quality research provides evidence that is robust and reliable. Evidence

provided through the use of randomized trial experiments is considered the gold standard

with comparison groups, or quasi-experimental, being the next most preferable design.

Studies that employ pre-post comparison groups, correlational design, case studies, and

anecdotes are not considered to have a strong scientific research base. True randomized

experiments that test for differences in outcomes after exposure to selected educational

intervention can legitimately provide strong evidence about the effects of the treatment.

However, relevance must be established to determine if the study involves a similar

intervention and outcome to those of interest and if the participants and settings were

representative of those of interest.

To be credible, the field of educational science must adhere to the quality standards

imposed on other fields of research. In fact, the hard science of medical research is often used

as a model for research in the soft sciences such as education, psychology, or sociology.

However, education is unique as it is observed through the multiple lenses of economists,

psychologists, and sociologists thus providing a wide range of legitimate research methods

(Odom et al., 2005). These multiple perspectives have the potential to form an exceptionally

strong research foundation in educational science as evidence exists to support the use of

multiple methods together to strengthen the research design. Furthermore, using a variety of

methods strengthens the conclusions that can be drawn from the research (Reyna, 2002).

High quality research methods lead to more powerful results that can be interpreted

and practiced with confidence (Odom et al., 2005). This is a step in the right direction; not

only do schools achieve compliance with NCLB but, most importantly, students improve in

their educational performance. However, responsible researchers caution that, even with the potential for a strong research base, any science that involves people is subject to effects stemming from the human quality. Realistically, researchers must come to understand that there is no absolute certainty in the findings of research in the field of educational science. Instead, researchers must strive to determine the degree of uncertainty in the findings (Reyna, 2002).

Scientific Research-based Instructional Strategies

The field of educational science has opened the door for exploration of instructional strategies from a scientific perspective. Although the NCLB *Act* does not require the use of scientific research-based instructional practices to acquire highly qualified teacher status, NCLB does mandate the use of scientific-based instructional practices as a foundation for data-based decisions. As defined in NCLB, s*cientific research-based instructional practices* are the teaching methods and strategies documented by a scientific process describing the quality and merit of the practices. The methods include well-designed randomized controlled trials, pre-post studies, large comparison studies, and meta-analysis of relevant research (US Department of Education, 2005). In addition, relevance to the practice of education and significance of the work, including effect size, provide proof of the scientific research-base (Marzano, Pickering, et al., 2001). High-quality research is designed to rule out alternative explanations for both the results of the study and the conclusions that researchers draw.

This section of the literature review underpins the major focus of this research proposal by providing information regarding specific instructional strategies and the scientific research that provides the evidence base for effectiveness of each strategy presented. A search of the U.S. Government sponsored NCLB website for instructional

practices that work for all students identifies two noted programs that address scientific research-based instructional strategies: *Strategic Instruction Model* (*SIM*) produced at the University of Kansas Center for Research on Learning (KU-CRL) and *Classroom Instruction that Works* published by Mid-Continent Research for Education and Learning (MCREL). While some commonalities are found within the two programs, each program is distinct in its approach to teaching and learning. The strategies for both of these models are defined within the following review of the literature.

Strategic Instruction Model

Since its conception in 1978, the University of Kansas Center for Research on Learning (KU-CRL) has received more than $70 million dollars of contracted research and development funds. As a result, KU-CRL has established an International Professional Development Network of more than 275,000 teachers in 3,500 school districts. The mission of the *Strategic Instructions Model (SIM)* is to dramatically improve the performance of at-risk students and students with disabilities in grades 4-12 through research-based interventions (*Strategic Instruction Model [SIM]*, 2006). *SIM* is a two prong approach to close the gap in achievement by using learning strategies along with content enhancement. The strategies prong is composed of the *SIM* curriculum and strategic tutoring while the content enhancement prong incorporates both planning routines and teaching routines. In the *SIM*, strategies are considered separate from content enhancement as the *SIM* curriculum and strategic tutoring provide direct instruction in strategy acquisition while content enhancement focuses on the daily routines or practices that support an effective, efficient learning environment. Table 2 illustrates the two prongs of the *Strategic Instruction Model* and the relationships between the components.

Table 2

Components of Strategic Instruction Model

Strategies	Content Enhancement
SIM Curriculum	Planning Routines
Strategic Tutoring	Teaching Routines

Note. From "Strategic Instruction Model," 2006. University of Kansas, Center for Research on Learning. Retrieved from http://www.ku-crl.org/sim/index.html, May 1, 2006.

The *SIM* learning strategies curriculum is divided into four categories based on the purpose of the strategy: acquisition, storage, expression of competence, and motivation. Table 3 indicates the various strategies that are identified within each of the main categories.

Table 3

Learning Strategies Curriculum

Purpose	Learning Strategy
Acquisition	Word Identification
	Paraphrasing
	Self-Questioning
	Visual Imagery
	Interpreting Visuals
	Multipass
	The Bridging Strategy (decoding, word id, fluency)
	Making Inferences
Storage	First-Letter Mnemonic
	Paired Associates
	Listening/Notetaking
	LINCS Vocabulary
Expression of Competence	Sentences
	Paragraphs
	Error Monitoring
	Themes
	Assignment Completion
	Test-taking
Motivation	Self Advocacy & Transition Planning
	Surface Counseling
	Possible Selves

Note. From "Strategic Instruction Model," 2006. University of Kansas, Center for Research on Learning. Retrieved from http://www.ku-crl.org/sim/index.html, May 1, 2006.

SIM uses an Eight-Stage Instructional Process to teach each of the learning strategies: 1) Assess and Make Commitments; 2) Describe; 3) Model; 4) Verbal Practice; 5) Controlled Practice; 6) Advanced Practice; 7) Posttest and Make Commitments; and 8) Generalization. To be effective the strategies must be taught with fidelity and explicitly including the process as well as the thinking that guides the process.

Results of the studies on the use of *SIM* reveal increases in student learning. Pre and post test results in some groups of students yielded a 24 point gain from initial scores of 54 to scores of 78 after incorporating the learning strategy for concept master. Another example of achievement gains is provided in Table 4 which details the percentage gain on social studies vocabulary tests after the incorporation of the LINCS strategy.

Table 4

LINCS Vocabulary Strategy Results: Mean Percentage Correct on Social Studies Vocabulary Tests

	Test 1 (Before LINCS)	Test 2 (After LINCS taught in Class A)
Students with learning disabilities in Class A	53%	77%
Students without learning disabilities in Class A	84%	92%
All students in Class B	86%	85%

Note. From "Strategic Instruction Model," 2006. University of Kansas, Center for Research on Learning. Retrieved from http://www.ku-crl.org/sim/index.html, May 1, 2006.

More results include comparisons of the Muskegon school district state-wide accountability score in relation to like districts and average scores for other districts in the state of Michigan (Strategic Intervention Model, 2006). Table 5 shows the trend for increasing scores recorded over a three year period.

Table 5

Muskegon in Relation to Like Districts and Average Scores for the State of Michigan.

	Year 1	Year 2	Year 3
Muskegon	94.1%	92.0%	93.8%
Comparable Districts	79.8%	78.2%	85.4%
State of Michigan	85.4%	85.9%	90.4%

Note. "Strategic Instruction Model," U.S. Department of Education. Strategic Instruction Model. Retrieved May 1, 2006, from http://www.ed.gov/teachers/how/tools/initiative/summerworkshop/stratinstr/edlite-slide001.html

Classroom Instruction That Works

According to the U.S. government sponsored NCLB website, ten regional educational laboratories have been established by the U.S. Department of Education to address the critical link between research and practice. Review of programs established at each of the laboratories reveals a significant body of educational research as well as references to high-yield instructional strategies supported by research to increased student achievement. While some of the regional education laboratories focus on issues of cultural relevance to the specific region, six of the laboratories reference *Classroom Instruction that Works* and two centers, Northwest Regional Educational Laboratory (NWREL) and Mid-Continent Regional Educational Laboratory (MCREL) focus extensively on these instructional strategies.

The scientific research base for *Classroom Instruction that Works* is rooted in nearly 40 years of research. In 1966, with the impact of the civil rights movement at a peak, James Coleman and his colleagues conducted a meta-analysis of the literature to investigate concerns about equality of educational opportunities. The meta-analysis, now commonly known as the Coleman Report, drew from a research base of more than 4,000 schools, 60,000 teachers and 600,000 students and revealed that schools only account for about 10% of the

variance in student achievement. Other factors such as the student's natural ability, socioeconomic status and home environment, all conditions that schools cannot change, appeared to account for the remaining 90% of the influence on student achievement (Coleman et al., 1966).

The initial findings of the Coleman Report were confirmed by Jenks et al. (1972) who reanalyzed the Coleman report and concluded that differences in student achievement test scores were due to factors that schools cannot control (Jenks et al., 1972). However, two decades later, Rosenthal (1991) reanalyzed the Coleman report and concluded that schools and teachers can have a powerful effect on student achievement. While the same 10% variance in student achievement was identified as in the original Coleman Report, these researchers determined that this variance equates to a percentile gain of 23 points. In fact, their findings indicate that a teacher working in a failing school can have a powerful effect on students even if the school does not. Moreover, these researchers determined that regardless of the ability or achievement levels of the students, instructional practices of the teacher were a decisive factor in improvement of student test scores. Likewise, Sanders and Horn (1994) and Wright et al. (1997) analyzed achievement of more than 100,000 students from hundreds of schools and concluded that the most important factor affecting student achievement is the teacher.

More recently, Marzano, Pickering, et al. (2001) added a new and practical perspective to the body of research supporting the role of the teacher in effective instruction. Drawing from the research base of effective instructional practices, these researchers conducted a meta-analysis of 30 years of research on classroom instruction reflecting the experience of thousands of educators. Building on the work of previous researchers and with

a focus on specific instructional strategies, Marzano, Pickering, et al. (2001) determined the average effect size of specific instructional practices and then translated the effect size for various instructional strategies into a percentile gain. This work resulted in the identification of nine categories of high-yield instructional strategies including: identifying similarities and differences; summarizing and note taking; reinforcing effort and providing recognition; homework and practice; nonlinguistic representation; cooperative learning; setting objectives and providing feedback; generating and testing hypotheses; and cues, questions, and advance organizers. The methods include randomized experimental trials, large correlational studies, and meta-analysis of relevant research. In addition, relevance to the practice of education and significance of the work, including effect size, provide proof of the scientific research-base.

Table 6

Classroom Instruction that Works: Average Effect Size and Percentile Gains for Identified High-yield Instructional Strategies

Category	Average Effect Size	Percentile Gain
Identifying Similarities & Differences	1.61	45
Summarizing & Note Taking	1.00	34
Reinforcing Effort & Providing Recognition	.80	29
Homework & Practice	.77	28
Nonlinguistic Representation	.75	27
Cooperative Learning	.73	27
Setting Objectives & Providing Feedback	.61	23
Generating & Testing Hypotheses	.61	23
Cues, Questions, & Advance Organizers	.59	22

Note. "Classroom Instruction that Works," by R. Marzano, D. Pickering, and J. Pollock. Alexandria, VA: Association for Supervision and Curriculum Development.

The following sections provide a detailed description, key research findings, and implications for the classroom for each of the high yield instructional strategies identified in the *Classroom Instruction that Works* model.

Similarities and Differences

Identification of similarities and differences is a fundamental cognitive process (Gentner & Markman, 1994; Medin, Goldstone, & Markman, 1995). The instructional practice of identifying similarities and differences engages students in the mental process of identifying ways concepts, ideas or objects are alike and different (Marzano, Pickering, et al.,

2001). While initially this process may focus on noun-object concepts, the process is most valuable when expanded to include a variety of concepts that may be both object and non-object. Moving from concrete concepts to more complex abstract comparisons requires an analysis of structure, process, and content to determine similarities and differences (Medin, Lynch & Solomon, 2000).

In identifying similarities and differences, the student develops the skill of recognizing patterns and making connections. Approaches include comparing and contrasting, creating metaphors, and constructing analogies. In comparing and contrasting ideas, the student is asked to identify attributes of an entity and then determine whether that entity is alike or different from other entities within the classification or group. In creating metaphors, students are asked to compare two ideas based on a single common underlying structure (NWREL, 2005). In a literal sense, the concepts of the entities may seem very different but a metaphor is formed by finding a general pattern that connects the ideas. Examples of metaphors are often found in literature with comparisons such as love is a rose or the soul is the window of a man. Finally, in constructing analogies, the student is asked to identify the common underlying structure that connects two ideas and then, based on this connection, form an additional pair of relationships. For example, in the analogy hot is to cold as black is to white, the common underlying structure linking hot to cold is the antonym. Based on this underlying structure, the student then must identify an additional pair of relationships that are linked as antonyms. In each approach, the student is asked to explain an unfamiliar concept in terms of a concept that is already understood (Marzano, Norford, Paynter, Pickering, & Gaddy, 2001). These approaches are developmental in nature as comparing and contrasting is considered a lower cognitive function than creating metaphors

and building analogies is considered a higher cognitive demand than creating metaphors; however, in all cases, identifying similarities and differences assists the student in processing new information by using the concepts of alike or different to overlay the new knowledge onto a known pattern (NWREL, 2005).

Key research findings. A review of the educational literature on identifying similarities and differences reveals that students must be explicitly taught to link, connect, and integrate ideas in determining relationships. Educational programs that challenge students to engage in these processes support the building of cognitive skills which underpins increased student achievement (Bransford, Brown & Cocking, 1999). In fact, in one study, employing the strategies of identifying similarities and differences in making comparisons, metaphors, and analogies, student achievement scores were reported to have increased from 31 to 46 percentile points (Ross, 1988). In another study involving a meta analysis of the research on identification of similarities and differences, the results revealed that explicitly teaching similarities and differences has an effect size of 1.61 and results in a 45 percentile point gain in student achievement (Marzano, Pickering, et al., 2001). Moreover, evidence exists to support the practice of combining the strategy of identifying similarities and differences with a method of using nonlinguistic representation will further enhance student achievement (Chen, 1999; Cole & McLeod, 1999).

Implications for the classroom. As revealed in the research, students benefit from explicit teaching of similarities and differences. Students are engaged in highly robust activities when the teacher uses rich discussion and inquiry relating new ideas to familiar ideas (Marzano, Pickering, et al., 2001; Solomon, 1995). This explicit teaching can be accomplished in a variety of ways. First, using familiar context, give students a model of the

steps for engaging in the process of identifying similarities and differences. Use activities that involve comparison, classification, metaphors, and analogies as students master more complex levels of thinking. Graphic organizers are useful tools for visual representation of similarities and differences. While teacher guidance is critical in the instructional stage with fading as students become more proficient in the process of identifying similarities and differences (Marzano, Pickering, et al., 2001), students also benefit from being asked to construct their own strategies for identifying similarities and differences (Mason & Sorzio, 1996).

Summarizing and Note Taking

Summarizing and note taking work hand in hand to assist students in the learning process. The strategy of summarizing enhances the students' ability to synthesize information while note taking helps students to organize information in a way that captures the main ideas and supporting details (Marzano, Pickering, et al., 2001). To effectively summarize, students must be explicitly taught to synthesize information. Synthesis is a higher order thinking skill that involves students in analyzing information to identify key concepts along with extraneous information. Extraneous information is discarded and only the important information is included in the summary (NWREL, 2005).

Summarizing may include strategies for both paraphrasing and rule-based summarizing (*SIM*, 2006; Marzano, Pickering, et al., 2001). When paraphrasing, students are taught to identify the most important information in a passage, including the main idea and critical details, and then rephrase the essential information in their own words (Strategic Intervention Model, 2006). In rule-based summarizing the focus is on teaching students a specific rule-based summarizing strategy.

Once students become effective at summarizing information, the related strategy of note taking is explicitly taught to help students to determine the content of the notes. Effective note takers reduce the information to a "nugget of meaning" which helps them to retain the information taught. Notes should be considered a work in progress as the teacher models effective note taking skills and works with students to review and refine their notes. Good notes are an effective tool for preparing for an exam, writing a research paper or other summative assessment activities (NWREL, 2005).

Key research findings. Generalizations from the literature on summarizing and note taking reveal that, as students begin to use tools for summarizing, reading comprehension improves (Meyer & Freedle, 1984). In fact, according to one meta analysis of the research on the benefit of using summarizing and note taking strategies, scores on standardized tests increased as much as 34 percentile points creating an effect size of 1.0 (Marzano, Pickering, et al., 2001). Furthermore, another study reports that when using a paraphrasing strategy as a tool for summarizing grade level material, students can increase their comprehension from 48% to 84% on a given assignment (Strategic Intervention Model, 2006). Teacher prepared notes, (Marzano, Norford, et al., 2001) as well as notes taken in the form of both linguistic and nonlinguistic representations are considered effective ways for teachers to model and encourage note taking (Nye, Crooks, Powlie, & Tripp, 1984). Finally, the research documents that by asking students to review and revise their own notes, the notes become more meaningful and useful as a tool for retaining information (Armbruster, Anderson, & Ostertag, 1987).

In addition to increases in academic achievement, the research indicates that by using summarizing and note taking strategies students improve their metacognitive skills. In one

study on using summary frames, students were observed to analyze information at a deep

level in order to decide what information to delete, what to substitute, and what to keep when

they are asked to give a summary (Hidi & Anderson, 1987). Furthermore, when students use

summary frames they are better able to understand what they are reading, identify key

information, and provide a summary that helps them retain the information (Armbruster,

Anderson, et al., 1987).

Implications for the classroom. As documented in the research, teaching students to

incorporate summarizing and note taking strategies into academic classes enhances learning

and contributes to an increase in academic achievement. The teacher can illustrate effective

note taking by modeling effective note taking on the board or by providing students with

teacher-prepared notes. In addition, notes may be taken in non-linguistic formats such as idea

webs, sketches, informal outlines, and combinations of words and schematics (Marzano,

Norford, et al., 2001; Nye et al., 1984).

By requiring students to use notes as a tool for discussion or a study guide for tests,

teachers reinforce the purpose and need for taking good notes. Students must know that the

more notes taken, the better; however, verbatim note taking is the least effective way to take

notes. Instead, teaching students a variety of note taking formats will provide students with

the tools for efficient and effective note taking. Students should be encouraged to consider

notes as a work in progress rather than an end product (Marzano, Pickering, et al., 2001).

Traditionally, teachers have simply expected or assumed that students could take

notes; however, the research indicates that students must be explicitly taught summarizing

and note taking strategies before they become effective note takers. To accomplish the skill

of summarizing, students are taught a variety of summary frames such as the narrative frame,

the topic-restriction-illustration frame, the definition frame, the argumentation frame, the problem solutions frame or the conversation frame. Regardless of which frame is used, to effectively summarize content students must analyze the information at a deep level and make decisions to delete some information, substitute some information, and keep some information (Brown, Campione, & Day, 1981; Marzano, Norford, et al., 2001). Being aware of the explicit structure of information assists students with summarizing information within a context.

Finally, instructional practices for summarizing and note taking may be couched within reciprocal teaching activities. With reciprocal teaching, students are asked to play various roles in the learning process, including the role of leader or teacher. In addition to summarizing, reciprocal teaching engages students in other thinking processes such as questioning, clarifying and predicting (Marzano, Pickering, et al., 2001). Reciprocal teaching activities begin with a summary statement that is provided by the teacher. Students are asked to read a short passage related to the summary statement. A student leader then poses various questions that are designed to assist students with identifying important information from the passage. Next, the student leader points out and clarifies information from the passage that may be confusing or difficult to understand. The final step in reciprocal teaching requires the student leader to ask other students to enhance the original summary statement and predict what will happen in the next passage. The cycle of teaching is then repeated (Marzano, Norford, et al., 2001).

Reinforcing Effort and Providing Recognition

Although research on instructional strategies typically focuses on helping students to acquire specific academic skills defined in the curriculum, some research exists to support

the need to help students understand how beliefs and attitudes can influence academic success. Explicitly teaching students the connection between academic success and their attitudes and beliefs enhances understanding of the relationship between effort and achievement (Marzano, Pickering, et al., 2001). In some cases, students develop the belief system that luck or circumstance is the only factor in success in school (Marzano, Norford, et al., 2001). In fact students who have experienced school failure are likely to believe that no matter what they are doomed to failure.

The strategies of reinforcing effort and providing recognition work hand-in-hand to encourage students to adopt a belief system that promotes a can-do attitude. By establishing a positive approach to school work, students are more likely to meet the high expectations set by their teachers (NWREL, 2005). However, the teacher must assume the critical role of providing recognition when student effort is exerted. Moreover, when the teacher creates an environment of high expectations for student learning and then provides recognition to reinforce student effort, students experience first hand the power of exerting effort in increasing academic achievement (Marzano, Pickering, et al., 2001). Establishing an instructional setting that provides recognition of personal effort and progress is always preferred to an environment of competition where distinct winners and losers are named (NWREL, 2005).

Key research findings. While the research indicates that not all students innately realize the connection between effort and achievement (Seligman, 1994; Urdan, Migley, & Anderman, 1998), the literature also supports the fact that students can be taught to operate from a belief system that supports the idea that an increase in effort can lead to improved school performance. In fact, a meta analysis of the research (Marzano, Pickering, et al., 2001)

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on reinforcing effort and providing recognition indicates that his powerful strategy yields an effect size of .80 and a 29 percentile point gain in student achievement. Rewards for accomplishment can improve achievement when the rewards are directly linked to successful attainment of an understood performance standard (Cameron & Pierce, 1994; Wiersma, 1992). However, if students do not initially understand the importance of effort, teachers must explicitly demonstrate the relationship between an increase in effort and an increase in success (Craske, 1985; Van Overwalle & De Metsenaere, 1990). Furthermore, teachers must make judicious decisions as to the most effective means of recognizing effort. Research reveals that even though we may live in a material society, abstract or symbolic recognition has more impact than tangible things, such as gum, movie tickets, or prizes (Cameron & Pierce, 1994).

In addition to the broad research findings on reinforcing effort and providing recognition, a specific example of this strategy is found in the literature focused on the use of positive behavior interventions and supports (PBIS). PBIS is defined as a proactive, positive approach for improving student academic and behavioral performance. Built upon the strong scientific research-base of applied behavior analysis, this approach is characterized by an analysis of student and school data that forms the basis for school structures and instructional practices. Furthermore, PBIS assumes a focus on teaching pro-social school behaviors. With PBIS students practice and are encouraged to use newly acquired skills, including effort to task, to maximize academic outcomes (Sugai & Horner, 2002). Various forms of acknowledgement are incorporated to keep students apprised of their progress including progress charts, awards, and praise (West Virginia State Department of Education, 1998).

Preliminary data are encouraging and support the notion that the use of PBIS holds promise to reverse the trend of violence in our schools that results from the more traditional reactive management approaches such as failure or school removal. In fact, the use of PBIS has gained national attention as the most effective approach to address incidents of school violence, the lack of discipline and pro-social behavior in schools, and the use of drugs and alcohol by youth (Sugai & Horner, 2002). The use of PBIS is included as a mandate in the 1997 and the 2004 reauthorizations of the Individuals with Disabilities Education Act as the preferred process for working with students who have cognitive and behavioral disabilities (Individual with Disabilities Education Improvement Act, 2004, Information Center on Disabilities and Gifted Education, 2005).

Implications for the classroom. The strategies of reinforcing effort and providing recognition rely on the ability of the teacher to use innovative approaches to demonstrate the connection between effort and performance. Using literary works that have a rags-to-riches theme or the work ethic of famous people who have become professional athletes or successful movie star are effective ways to gain student interest in and a commitment to increasing personal effort to school work. Teachers might also engage students in a multi-sensory discussion of what effort looks like, sounds like, feels like, smells like or tastes like. When teachers employ instructional practices that explicitly teach students about the importance of effort, students begin to understand the relationship between effort and performance.

In addition to explicitly teaching the concept of effort, teachers must also provide recognition of effort by using a system of rewards and effective praise for students' accomplishments related to the attainment of a goal (Marzano, Norford, et al., 2001).

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Students who are routinely recognized for effort will make the connection between effort and improvement. However, teachers must use restraint in recognition of effort as verbal praise for simple tasks may send the message to the student that any amount of effort is worth recognition. Teachers should be careful to recognize all effort that relates to progress toward an authentic standard of performance. This recognition is powerful in establishing a pattern of increased effort leading to increased academic performance (NWREL, 2005).

One effective approach to praise is the use of the Pause, Prompt, and Praise strategy. In this practice, the teacher asks a student who is experiencing frustration with the demand of a task to pause. During the pause the teacher and student engage in a discussion in an effort to identify the source of the difficulty. The teacher then provides a prompt or suggestion as to how to over come the barrier. When the student incorporates the suggestion and makes improvement, the teacher then delivers effective praise in recognition of the student's accomplishment (Marzano, Norford, et al., 2001).

Finally, in an effort to encourage self-directed learning, teachers might provide visual representations of effort by using group effort logs or class effort rubrics as reminders of the importance of effort in academic achievement. Charting progress by using a poster depicting a measurement gage such as a ruler or thermometer provides students with up-to-the-moment recognition of progress toward the goal. Similarly, individual students are encouraged to set personal goals. When these goals are achieved at a pre-determined standard of excellence, recognition should be given that acknowledges the unique personal achievement of the student. Teachers who understand the value of tapping into affective domain as a means for improving achievement often reap the benefit of high achieving students.

Homework and Practice

Historically, the use of homework has been an institution within the institution of school. From the earliest establishment of schools, teachers have assigned homework as a means of additional practice on concepts introduced at school (Simplicio, 2005). Dr. Harris Cooper of the University of Missouri-Columbia, an expert on the research of homework and practice, defines homework as simply "tasks assigned to students by school teachers that are intended to be carried out during non-school hours" (Lacina-Gifford & Gifford, 2004, p. 279). According to Marzano, Pickering, et al., (2001) homework and practice provide students with an opportunity to deepen understanding of content knowledge that has been learned.

Practice is defined as the repeated application of new learning and the goal of practice is to help students achieve mastery of skills. The strategies of homework and practice are inherently connected by the supposition that when students are learning on their own, they are in effect, practicing or applying new knowledge. Effective teachers use the strategies of homework and practice to address a specific goal such as the need to reinforce a skill that is partially mastered or the need to review a skill that is considered prerequisite to new learning that is to be introduced (NWREL, 2005). Regardless of the goal, effective teachers provide feedback on all homework and practice assignments (Simplicio, 2005; Walberg, 1999).

Key research findings. A review of educational research reveals multiple studies confirming a positive correlation between homework and higher levels of student academic achievement (Marzano, Pickering, et al., 2001; Simplicio, 2005). In fact, the use of homework as an effective strategy for reinforcing learning is documented in educational research for all grade levels, elementary through college (Simplicio). The impact of

homework on achievement increases as students move through the grades. At the high school level, for every 30 additional minutes of homework completed daily, a student's GPA can increase up to half a point (Keith & Cool, 1992). Elementary students should be assigned homework to establish good learning and study habits (Cooper, Lindsay, Nye, & Greathouse, 1998).

Research indicates that by engaging in homework and practice activities, students can increase their achievement on standardized tests by as much as 28 percentile points creating an effect size of .77 (Marzano, Pickering, et al., 2001). Moreover, some research indicates that an increase in the amount of homework a student does is directly related to the increase in grade point average (Simplicio, 2005).

In addition to academic gain, proponents of homework boast that, when carefully designed to incorporate the use of Internet, telephone, and other communication methods, homework provides an opportunity to develop social communication skills. These exchanges, when coupled with community activities, create a sense of community and facilitate development of natural, collaborative communities. Furthermore, homework provides an opportunity for students to learn in a real world setting. Cooper suggests that, "It [homework] should be one of several approaches we use, along with soccer and the scouts, to show our children that learning takes place everywhere" (Lacina-Gifford & Gifford, 2004, p. 281).

Critics of the use of homework as a strategy for reinforcing mastered concepts cite several reasons for their disapproval. First, consistency among teachers is problematic. Some teachers give no homework while others give extraordinary amounts. This variation has been reported at all grade levels and across numerous school districts. Second, homework may not accomplish the intended goal of providing more practice on a skill introduced at school.

Students who do not comprehend the concepts taught at school will not be able to perform the homework assignment satisfactorily. Assigning more of the same work as completed at school will do little to help a struggling student. Moreover, students who have mastered the skill will view the homework as boring or monotonous. In both cases, the homework assignment can create a negative impact on a student's attitude toward school work (Simplicio, 2005). Results of a Public Agenda Survey conducted in 1998, revealed that nearly one half of the parents surveyed reported a serious argument with their children concerning homework (Lacina-Gifford & Gifford, 2004).

Next, critics of the use of homework as an instructional strategy describe the devastating effects that the demand for homework can have on students' whose home situations do not support homework. They cite homework as a contributor to increased dropout rates among minority and poor students. Homework rarely considers the individual learning styles of students and is an added source of frustration and fatigue for students who learn differently. In addition, critics believe that the positive effects for middle class students resulting from homework are exaggerated at best (NWREL, 2005). Finally, due to the time demands on families and students, students may complete the homework in a careless manner resulting in poor quality of work. This practice may instill a belief that turning in poor work is acceptable especially if teachers do not provide feedback on homework (Simplicio, 2005).

Implications for the classroom. As revealed in the research, well-designed homework and practice activities have a positive effect on school performance. Effective teachers understand that homework is used for a variety of reasons and that different types of homework assignments can help students to reinforce skills. The four types of homework

include: memorization of important information so it becomes rote; increase in speed so that students can more efficiently apply skills in complex problem solving; deepening and expanding knowledge; and prerequisite skills or preparation for a future activity. Teachers can maximize the benefit of homework and practice by setting a goal for the assignment and matching the goal with the appropriate type of homework.

Equally important to determining the goal and selecting a matching type of homework is the need for the teacher to identify the student's independent skill level. Presumably, the student will be working alone to complete homework so it stands to reason that the homework assignments should be assigned at the student's independent skills level rather than the student's instructional level.

While the research indicates a strong correlation between homework and academic performance, studies also indicate that homework should be approached not as an afterthought to the school day, but as a focused strategy for increasing understanding. In addition, teachers must employ reasonableness in order to gain the cooperation of parents and students (Marzano, Pickering, et al., 2001). Most parents will agree that daily homework is academically sound; however, when the amount of homework each evening interferes with extra curricular activities or family activities, parents complain. In addition, the amount of homework should be customized to the student's grade level (Simplicio, 2005). Multiplying the grade level of the student times 10 minutes is the suggested rule for determining the amount of homework per night (NWREL, 2005). Recent research indicates that there has not been an increase in the amount of homework as students on the average have approximately one hour of assignments. However, access to the Internet has been reported as a tool for decreasing the amount of time students spend researching topics (Simplicio, 2005). Clearly,

the amount of homework assigned to students should be different from elementary to middle to high school.

Furthermore, parent involvement in homework should be kept to a minimum; parents should act as facilitators rather than actual problem solvers in completing homework assignments (Marzano, Pickering, et al., 2001; NWREL, 2005). Parents of young children express concern about fatigue and lack of ability to work independently while parents of older students complain that teachers do not consult about homework assignments which can result in multiple teachers assigning multiple assignments in a single evening. Parents, as well as students, are more likely to complain if the homework is redundant and meaningless (Simplicio, 2005). Teachers must recognize unique student needs and adapt homework and practice to accommodate these needs (NWREL, 2005).

Effective instructional practices for assigning homework include establishing and communicating a homework policy that clearly articulates the purpose of homework. For each homework assignment, the teacher must determine the purpose and inform students of the outcome of homework assignments. Mastering a skill requires focused practice; however effective practice requires students to adapt and shape what they have learned. Additionally, homework is more effective when teachers use a variety of approaches for providing feedback. Feedback may include activities that ask students to chart accuracy and speed or focus on specific elements of a complex skill or process. Planning time for feedback provides students with opportunities to increase their conceptual understanding of skills or processes (Marzano, Pickering, et al., 2001; NWREL, 2005).

Nonlinguistic Representation of Knowledge.

Brain-based learning research has confirmed that multiple sensory modes are used in acquiring and retaining knowledge (Gardner, 1993; NWREL, 2005). The use of nonlinguistic representations in instruction enhances students' ability to represent and elaborate on knowledge using mental images. Learners acquire and store knowledge in two primary ways: linguistic (by reading or hearing lectures), and nonlinguistic (through visual imagery, kinesthetic, or whole-body modes). The more students use both systems of representing knowledge, the better they are able to think about and recall what they have learned (Marzano, Pickering, et al., 2001).

Traditionally, schools employ a linguistic approach to learning relying on reading and lecture as the primary mode for acquiring information (NWREL, 2005). However, some students are more successful when provided with a nonlinguistic approach which includes the use of graphic organizers, pictures, pictographs, concept maps, idea webs, and dramatizations, to represent knowledge (Marzano, Pickering, et al., 2001; NWREL, 2005). Furthermore, students may be asked to generate physical models and mental pictures of the concepts they are learning. Incorporating kinesthetic activities as nonlinguistic representations of knowledge may be particularly effective with resistant learners (Marzano, Pickering, et al., 2001). In fact, Jensen (2000) reports that the link between movement and readiness for the brain to learning is inescapable. In the past two decades, computer technology and simulations have provided a nonlinguistic approach that gives students an unprecedented opportunity to manipulate and explore the learning experience in new ways. This exploration may lead to inquiry and discussion that promotes deeper thinking and better understanding (NWREL, 2005).

Key research findings. The research indicates that use of nonlinguistic representation in presenting instruction yields an effect size of .75 and produces a 27 percentile point gain in student achievement (Marzano, Pickering, et al., 2001). Possibly the most well-known research on nonlinguistic approaches to teaching and learning can be found in the example of Howard Gardner's theory of multiple intelligences. Over the past twenty years, Gardner has popularized his theory which employs a belief that the traditional idea of intelligence, based on IQ testing alone is far too limited. Instead, Gardner (1993) defines nine different intelligences to identify and measure a broader range of human potential in children and adults. Specifically these intelligences are defined in the following manner: linguistic intelligence or word smart; logical-mathematical or number smart; spatial intelligence or picture smart; bodily-kinesthetic intelligence or body smart; musical intelligence or music smart; intrapersonal intelligence or self smart; and naturalist intelligence or nature smart.

Another noted researcher and scholar, Eric Jensen (1998), offers his model outlining six conditions in which optimal learning can be achieved: (1) Personal History—Everyone has experiences, values and beliefs which affect the learning process; (2) Elements of the Environment—Feelings, goals and moods all take part in learning; (3) Sensory Involvement—All five senses are integrated within the process of learning; (4) Learning Preferences—Learning is processed through the abstract or concrete and each learner has an individual learning preference; (5) Connected Experience—Learners make connections and meaning to form conclusions that are interconnected through individual experiences; (6) Individual Responses—Responses can be intrapersonal, interpersonal, verbal, kinesthetic, musical and/or logical and all will have meaning making to the learner.

Other studies support the effectiveness of asking students of all ages to represent knowledge in a nonlinguistic form as a strategy for augmenting learning. Atherton (1998) reports on the effectiveness of using role play with graduate students. In this account, students were assigned to take on the role of well-known philosophers such as Plato or Aristotle. With the persona approach, students responded to questions and engaged in dialogue from the perspective of the philosopher they were playing. As a result, the researcher concludes that to increase success, students must listen, learn, and use creativity and imagination along with engaging in the writing process.

Other generalizations from the research include the fact that a variety of activities produce nonlinguistic representations and that nonlinguistic representations should elaborate on knowledge (Marzano, Pickering, et al., 2001). First, visual representations may take a variety of forms and help students recognize how related topics connect (NCTM, 2000). By encouraging students to find patterns and then organize information within patterns helps with recall and application of knowledge. Research has shown an increase in understanding of geometry when students learn to represent and visualize three-dimensional forms (Bransford et al., 1999). Next, brainstorming activities help students to generate ideas; however, brainstorming can be enhanced and lead to a deep level of thinking when students are asked to use thinking maps to help them organize key concepts in a visual way (Hyerle, 1996). Finally, the use of nonlinguistic representations within the field of science helps students to investigate phenomena under simulation. As a result of software designed to permit student to create visual representations of core chemistry concepts, students are able to generate explanations for the phenomena (NWREL, 2005).

Implications for the classroom. A nonlinguistic approach to teaching and learning is rich in a variety of modes, styles, and intelligences. Teachers should access and integrate these modes for increasing opportunities for students to access and retain new knowledge. Effective teachers model the use of new tools as students may be accustomed to only learning in a linguistic mode. By using scaffolding to introduce new activities, teachers walk students through the process of learning nonlinguistically. Through gradual fading of the scaffolds, students can then learn to use the tools independently (NWREL, 2005).

In a nonlinguistic approach, teaching and learning are characterized by the use of graphic organizers and pictographs to provide visual representations of mental images. When teaching students to use graphic organizers, teachers are encouraged to begin with familiar, high interest content such as a current hit movie. Students are then presented with a variety of options for organizing the information including a web, a Frayer model, or pattern organizers. Teachers may engage in questioning to elicit information and then model the transfer of the information to the graphic organizer.

The use of pictographs involves the task of artistic representation of mental images. Students may draw symbols or actual objects to represent concepts and ideas related to an area of study. Both graphic organizers and pictographs provide visual organization for information and serve as tools for the speaking, writing, or assessment processes in learning (Marzano, Pickering, et al., 2001). Encouraging students to use sketches, graphs, and symbols in note taking, results in more meaningful and useful notes. Undoubtedly, science and math classrooms provide a natural setting for integrating nonlinguistic representations; however models, graphs, imagery and patterns as nonlinguistic representations of knowledge can also be effectively integrated within delivery of language arts content (NWREL, 2005).

Innovations in technology provide multiple ways of representing knowledge nonlinguistically. Through multimedia presentations, students have an enhanced sensory experience as they see a picture of an object, listen to the sound it makes, and seeing it move within the natural environment. In addition, computer simulations allow students to construct models of learning. By explaining their models, students achieve a deeper understanding of the knowledge which results in an increased opportunity for questioning and use of high levels of thinking and problem solving. Finally, through virtual experiences, students can actually inject themselves into various environments which are powerful experiences for students who have difficulty with understanding abstractions, interpreting language, or using imagination.

By understanding the body-mind connection, teachers can set the stage for students to learn through movement, simulations, and role play. To be effective when using role play activities, teachers should incorporate three stages of activities into the design of the role play. First, the students should be given an opportunity for warm-up. During this activity, students are prepared for the experience and develop an increased comfort level with the expectations for their assigned role. Next, students engage in the action stage. In this stage, students become oriented with the protagonist and other auxiliary role players before actually interacting with them. Teachers and students provide comments and feedback on the progress to this point in the role play activity. Finally, the role play activity is ended with a discussion that provides closure to the learning that has occurred (Swink, 1993).

Finally, whether using the Gardner or Jenson model of addressing multiple intelligences, the teacher must begin by addressing various modes of learning while planning instruction. Once the teacher has selected the concept to be taught, the inquiry process may

be customized to encourage the use of different modes, styles or intelligences as possible (Gardner, 1993; Marzano, Pickering, et al., 2001). For example, music and rhythm activities such as dance, song, background music, and raps may be incorporated into the instruction to address the musical intelligence or use of real life material and activities such as plants, animals, cooking, fishing, and collecting items may be included to meet the needs of the naturalist. Foster cooperative learning activities by encouraging students to work in teams as they construct nonlinguistic representations will appeal to the intrapersonal intelligence. By questioning and discussing within the group, students refine their communication and thinking and problem solving skills.

Cooperative Learning

The instructional practice of cooperative learning involves groups of students working together to complete a common task. Considered as educationally rich activities, lessons that are taught in cooperative groups not only engage students in academic tasks but also demand a social component likened to work in a real world setting. As a result, this otherwise simple grouping strategy becomes a complex construct that requires teacher training and careful planning to optimize the learning experience (Siegel, 2005). Of all grouping strategies, cooperative learning is considered to be a flexible yet powerful tool for increasing student learning (Marzano, Pickering, et al., 2001).

Key research findings. A preponderance of research exists to support the use of cooperative learning as a strategy to promote both academic achievement and social skills development (Clements & Nastasi, 1993; Elmore & Zenus, 1994; Madden & Slavin, 1983; O'Melia & Rosenburg, 1994; Qin, Johnson, & Johnson, 1995; Slavin, 1993; Stevens & Slavin, 1995). In fact, cooperative learning is recognized by many researchers to be a critical

element of school reform movements (Johnson & Johnson, 1999; Stevens & Slavin, 1995). According to Marzano, Pickering, et al., (2001), the use of a cooperative learning strategy yields a .73 effect size which translates into a 27 percentile point gain in student achievement. Overall, cooperative learning contains five defining elements including positive interdependence, face-to-face promotive interaction, individual and group accountability, interpersonal and small group skills, and group processing (Johnson & Johnson, 1999).

Critics of cooperative learning caution that gaps in the research result from quasi-experimental studies that do not reflect the real-life use of cooperative learning in the classroom. Grossen (1996) advocates that more extensive studies should be conducted within the context of the typical classroom before the use of cooperative learning as a teaching tool can be considered valid. Grossen cautions that when used in uncontrolled settings without careful consideration to group design, potentially negative effects on academic as well as social development may result. Generalizations from the research indicate that forming cooperative groups based on ability levels alone is not effective in narrowing the achievement gap between the low ability students and the middle and high ability students (Oakes, 1985). Instead, using a variety of criteria such as interest or alphabetical or random assignment provides for heterogeneous grouping of students. In fact, teachers may decide to use factors such as favorite colors or birthdates to assure heterogeneity. Regardless of how group assignments are made, the teacher must provide careful monitoring to assure that the group is working. While the use of cooperative learning does require teachers to incorporate new methods into classroom practice, teachers should consider building these new methods upon knowledge of and experience with existing instructional methods. As a result, teachers

are able to internalize the resulting classroom experiences so those experiences enhance their further understanding of cooperative learning (Siegel, 2005).

  Implications for the classroom. Cooperative learning affords the teacher the flexibility to vary grouping patterns by using three types of cooperative learning groups including informal, formal, and base groups. Informal groups are best described as short term ad hoc groups lasting from a few minutes with a goal of accomplishing fast paced activities such as a think pair-share. Formal group assignments are considered more long term and may last for several days to weeks. Formal groups provide adequate time for completion of long term assignments. Finally, base groups are designed to provide support to students throughout a semester or an academic year. Cooperative learning strategy is most effective when groups are kept rather small in size. As well, cooperative learning should be used consistently and systematically, giving care to not overusing the practice (Marzano, Pickering, et al., 2001).

Generating and Testing Hypotheses

  Generating and testing hypotheses involves the use of thinking and reasoning skills to explore a problem. With this strategy, students engage in activities involving the application of knowledge (Marzano, Pickering, et al., 2001). Obviously a two-step strategy, generating and testing hypotheses first requires identification of a relevant problem within a content domain that is linked to a real-life context. This process implies that the circumstance of the problem will be fluid as we live in an ever-changing world. The second step of the strategy, testing hypotheses, requires the use of multiple approaches to investigate the problem (Savery & Duffy, 1995). Although this strategy naturally applies to the field of science, generating and testing hypotheses may be used across the curriculum as a means of

generalizing learning (Marzano, Pickering, et al., 2001; Savery & Duffy, 1995). For example, in public education, each state is responsible for determining education standards for each grade and subject. These content standards become the concepts or principles that are foundations for generating hypotheses that have a real world relevance to the student. In a practical sense, this strategy requires teachers to link the defined state standards and objectives to real life experience of students (Savery & Duffy, 1995). As a result this approach holds the promise of developing motivated learners who achieve quality outcomes that are relevant and contribute to increased skill for being successful in life (Marzano, Pickering, et al., 2001).

Key research findings. An educational approach that emphasizes the skill of generating and testing hypotheses yields an average of a .61 effect size resulting in a 23 percentile point gain in student achievement scores. Students may employ an inductive or deductive approach in hypothesis generation and testing. With inductive reasoning, students are required to first discover the principles and then generate the hypotheses; with deductive reasoning, students are presented with a principle and then, using this principle, asked to generate and test hypotheses, building new knowledge upon existing understanding. Teachers facilitate this process by requiring students to clearly explain their hypotheses and their conclusions (Marzano, Pickering, et al., 2001).

Implications for the classroom. To guide students through this process, teachers may plan various activities that encourage students to engage in systems analysis, problem solving, historical investigation, invention, experimental inquiry and decision making. In fact, well designed lessons may incorporate the use of several of these processes within a single topic. Teachers may use carefully designed instructional practices to assure that

students clearly state and explain their hypothesis and conclusions including the use of templates as a framework for students to report their work and explanations. Including sentence stems on the template will help students to articulate hypotheses and explanations. Students may make audiotapes in lieu of written reports to explain hypotheses and conclusions. Evaluation of student work may incorporate the use of rubrics so that the criteria for quality of explanations are clearly defined. Encouraging a culture of public assessment may be achieved by setting up events in which parents and community members ask students to explain their work (Marzano, Pickering, et al., 2001).

One researcher, Gallagher (2004) presents a unique view on the task of defining a problem with his suggestion that the skill of defining the problem be replaced with the skill of problem finding or the ability to define and frame a relevant question. In fact, Gallagher suggests that problem finding may be the most significant thinking skill taught in schools today. Furthermore, Gallagher laments the fact that in our system of education, the teacher most often identifies and assigns the problem with little consideration of relevance to the student. Problem finding that produces an authentic question leads to a valid problem; a valid problem enhances the quality and outcome of the investigation. Problem finding is an unending process that promotes the use of dreams and imagination in the investigation process.

In the facilitation of problem finding, the teacher must assume the critical role of assisting students in the process of defining and framing a relevant question and then encouraging them to explore various options to answer the question. These skills encompass the art of problem finding and it is this task of problem finding that "separates the creative artist, the creative writer, and creative scientist from the run of the mill practitioners."

Gallagher cautions that problem finding is not an easy task. His mantra, "Problems worthy of attack, prove their worth by hitting back," suggests that if a problem has an easy solution, it may not be of significance (Gallagher, 2004, p. 17). Gallagher proposes that, through this process of problem finding, solutions to large problems like crime or education of the poor may be found. However, he warns that these solutions may cost money and take people outside of their comfort zones. Furthermore, learner-created problems do not automatically assure authenticity; teachers must be prepared to discuss and negotiate with the students to identify a problem that is authentic in its cognitive demands and for which the student can take ownership (Savery & Duffy, 1995).

One example of generating and testing hypotheses can be found in the problem based learning (PBL) approach to education which has recently been popularized in medical schools in Europe but is now spreading to other schools around the world. The goal of PBL is to help students effectively acquire knowledge by activating their prior knowledge to help them understand new information (Morrison, 2004). Different from a Socratic process or discovery learning, PBL starts with a problem that is relevant to real-life scenarios which encourages student ownership. Rather than focusing only on cognitive outcomes, PBL focuses on the metacognitive processes in learning. The facilitation is not knowledge driven, but rather it is focused on metacognitive processes.

PBL employs the belief that authentic outcomes are not possible with artificial problems. The instructional principles are grounded in constructivist thought and embrace the following principles: 1) anchor all learning activities to a larger task or problem; 2) support the learner in developing ownership for the overall problem or task; 3) design an authentic task; 4) design the task and the learning environment to reflect the complexity of the

environment they should be able to function in at the end of learning; 5) give the learner ownership of the process used to develop a solution; 6) design the learning environment to support and challenge the learner's thinking; 7) encourage testing ideas against alternative views and alternative contexts; 8) provide opportunity for and support reflection on both the content learned and the learning process (Savery & Duffy, 1995).

Critics of the PBL curriculum cite a lack of empirical evidence to support the approach. Some research reveals that PBL curriculum is more expensive to implement than a traditional approach and does not appear to pay off with educational gains. The overall findings indicate that students who participate in PBL show little or no improvement in scores on written examination when compared to students who follow a conventional curriculum. However, research does confirm that students who participate in PBL report an increased level of satisfaction and enjoyment with their learning experience. As well, some evidence exists to support the notion that PBL promotes a disposition to life-long learning. In addition, employers report that they prefer PBL students and observe that they do better on practical examinations when compared to traditionally taught students (Morrison, 2004).

Cues, Questions and Advance Organizers

Cues, questions, and advance organizers create a framework that draws the focus of instruction to essential information and helps students to organize their prior knowledge as a tool for preparing to learn new information (Marzano, Pickering, et al., 2001). Cues and questions work hand in hand to help the teacher set the stage for learning (NWREL, 2001). Cueing and questioning come naturally to most teachers. In fact, some 80 percent of student-teacher interactions involve cues and questions (Marzano Pickering, et al., 2001). By using questioning strategies that are research-based, teachers can fine-tune their natural inclinations

for questioning and become more effective in guiding student learning (NWREL, 2005). By employing strategies that are effective to cue or prompt students to reply to carefully designed questions, the teacher creates an approach to learning that engages students in high levels of critical thinking and problem solving (Marzano, Pickering, et al., 2001).

As with cues and questions, advance organizers help to prepare students for learning. Ausubel (1960) describes advance organizers as a cognitive strategy to help students learn and retain information. Advance organizers may take a variety of forms including skimming and scanning text (Marzano, Norford, et al., 2001). Also teachers may use a strategy such as a K-W-L chart before presenting new information. With this strategy, students are asked to record what they know, what they want to know, and what they have learned about a concept (Ogle, 1986; Thompson, Thompson, & Thompson, 2002). In addition, the teacher may employ a variety of graphic organizers to illustrate how ideas and concepts relate (NWREL, 2005).

Key research findings. According to Marzano, Pickering, et al., (2001), when used in combination, the instructional practice of providing cues, questions and advance organizers yields an effect size of .59 and a 22 percentile point gain in student achievement. Moreover, when teachers focus their questions on content that is most important rather than on what may be unique or interesting to students, learning increases (Alexander, Schulze, & Kulikowich, 1994; Risner, Nicholson, & Webb, 1994). Teachers are more naturally inclined to ask questions that require only basic recall of information (Fillippone, 1998); however, students' ability to use critical thinking and problem solving skills is increased when teachers refine their questioning strategies to require students to analyze, synthesize or evaluate inform (Redfield & Rousseau, 1981). In addition, by increasing the amount of "wait time"

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after asking a question, teachers foster an environment that is rich in discourse and student-to-student interaction (Fowler, 1975). The research on using cues and questions indicates that, to maximize the effectiveness of the strategy, teachers should ask questions both before and after the learning experience (Marzano, Pickering, et al., 2001).

In addition to using cues and questions, teachers can influence the quality of learning by using advance organizers to help connect information that a student already knows to new content and concepts. Predicting what prior knowledge might be relevant to the learning experience is essential to maximize the effectiveness of this approach. Teachers must not assume that students possess the essential prior knowledge for learning a new concept; instead teachers must confirm prior knowledge by probing with the help of advance organizers (Marzano, Norford, et al., 2001). Moreover, presenting information graphically as well as symbolically in an advance organizer reinforces vocabulary learning and supports reading skills (Brookbank, Grover, Kullberg, & Strawser, 1999).

Implications for the classroom. Instructional practices for providing cues and questions include the use of explicit cues and refined questioning techniques. Questions should be posed in a manner that requires students to think before answering. By asking analytic questions, teachers encourage students to use more complex thinking skills. Furthermore, by inserting a pause or wait time before accepting or confirming an answer, teachers encourage students to answer more thoughtfully and completely.

Advanced organizers may take the form of narrative or expository activities. In using narrative advance organizers, teachers tell stories that prepare students for new learning. Stories that relate to real-world events or are personalized to the life experiences of the students serve as natural motivation for learning. Expository advance organizers provide

straightforward descriptions of new concepts or content. These organizers may be provided in written form or orally and should emphasize the essential content, not merely what might be considered sensational or interesting.

In addition to narrative and expository organizers, students should be taught skimming and scanning as advance organizers. Skimming strategies require students to quickly peruse the text to look for a specific word or phrase that relates to the targeted information. Scanning techniques are used to locate a specific type of information such as a date or proper noun. When scanning text, students learn to glide over text to locate numbers when looking for dates or other numerical information. When looking for proper nouns, students scan for capital letters that signal the name of a person or place. Teachers may choose to teach a strategy explicitly such as the Pre-Reading Plan. This strategy provides a systematic process using two stages of skimming and scanning to prepare students for reading. Ultimately, strategies such as the Pre-Reading Plan enhance the students' comprehension of text.

Advance organizers may also take the form of graphic organizers. Teaching students how to use graphic advance organizers effectively such as the KWL Plus strategy (similar to KWL strategy but adds the components of summarizing and mapping text) and anticipation guides in which students answer questions that relate directly to the main concepts in the text using only their background knowledge. Strategies such as 5-3-1 in which students work individually to collect their thoughts and then in small groups to organize, compare, contrast, synthesize, and sort information as well as LINK which requires students to List, Inquire, Note, and Know information. Finally, structured note taking helps students take notes effectively so they can better understand the material. Students may use graphic organizers

that reflect the structure of the text. Directed Reading/Thinking Activity (DR/TA) is a specific advance organizer that helps to develop active reading skills (Marzano, Pickering, et al., 2001).

Thematic Instruction

As implied by the name, thematic instruction is focused on the use of a theme that links the conceptual context of learning under a central idea (NWREL, 2005). Effective thematic instruction is not limited to the obvious subject or unit approach in which students learn about seasons, elements of chemistry, or the civil war; instead subjects and units are integrated into themes that might be considered as enduring understandings with a broader context such as change is never ending; elements are essential to the existence of living organisms; or past events affect the future. By relating themes to universal understanding, thematic instruction provides a rich educational environment that is ripe for expanding the learning of factual information into the realm of higher order thinking by asking the essential questions of how, why, and to what extent (Thompson, Thompson & Thompson, 2002). In addition, thematic instruction that builds on the prior knowledge of students provides multiple opportunities for students to engage in varied activities to demonstrate their learning. Furthermore, by linking thematic instruction to real life experiences, students participate in authentic tasks that capitalize on meaningful learning (Bergeron & Rudenga, 1996). Thematic instruction engages students in not only fun activities but also helps to make connections to abstract ideas and understanding (NWREL, 2005).

Key research findings. Generalizations from the research offer support for the use of thematic instruction as a strategy for improving academic performance. In fact, of 10 schools receiving government awarded Comprehensive School Reform Grants to implement

integrated thematic instruction, seven of the schools showed gains in both reading and math at most grade levels one year into the project. The percentage of growth ranged from increases of 27.8% in math and 11% in reading at one school to an increase of 14.9% in math and 10.9% in reading at another. One school showed a 17% gain in the district average as compared to a 22% drop the previous year. Three schools showed gains across every grade tested in both reading and math (Frederick & Kovalik, 2004a). A similar study conducted with six Title I elementary schools in Texas reveals that after the implementation of integrated thematic instruction a 31% increase was noted in math scores and an 11% gain in reading. Moreover, when compared to district averages, five of the six schools showed an increase in the percent of students successful in reading that was higher than the district average (Frederick & Kovalik, 2004b).

According to Beane (1997) and Kovalik & Olsen (1994), the use of thematic instruction contributes to an increase in student achievement by relying on the structures of the brain that are inherent to the learning process. Engaging students in activities that challenge them to link, connect, and integrate ideas within an authentic context results in an increase in cognitive skills (Bransford et al., 1999). Furthermore, research on brain-based teaching reveals that the brain processes information more efficiently through nonlinear patterns that emphasize coherence rather than fragmented, unconnected entities. The efficient processing of information leads to increase accuracy and ability for students to recall, integrate, and demonstrate knowledge. By explicitly connecting patterns within an authentic task, teachers present information in a format that is compatible with the brain's inherent process for integrating new information (Caine & Caine, 1995).

Finally, educational research supports the use of thematic instruction as a systematic method for planning authentic tasks that provide mental organizing schemes for students to understand new concepts (Caine & Caine, 1995; Kovalik & Olsen, 1994). Educational research supports the power of authentic instructional tasks which has led to support for the inclusion of authentic instruction in recent efforts of instructional reform (Schlecty, 1990). As school populations become more culturally diverse, educational environments that are free of threat and engage students in meaningful, authentic instructional tasks have become more critical to the success of at-risk students. Thematic instruction provides opportunities for students to make choices. This act of choice making promotes critical thinking, decision making and reflection. Furthermore, learning experiences that provide opportunities for personal choice, encourage the student to share responsibility for the learning process as student choice requires critical thinking, decision making, and reflection (Caine & Caine, 1995).

Implications for the classroom. In effective thematic instruction, new information is presented by first determining existing knowledge about a topic or concept and then extending this knowledge to a new situation. Moreover, rather than presenting facts in isolation, teachers address content with an integrated approach. This integrated approach allows teachers to address content in depth and provides opportunities to individualize instruction for students who need extra attention. Additionally, an integrated approach helps students to make connections within content areas and enables students to more easily understand and apply the new knowledge (Barton & Smith, 2000).

Curriculum mapping is one example of integrating content into thematic instruction. The curriculum mapping process begins with a review of the content standards for core

subjects at all grades. The content standards are prioritized according to grade level to establish a developmental sequence of skills. Once the prioritized curriculum is established, concept maps for each of the major curricular themes are prepared. Each theme is then expanded to include universal understandings and essential questions are developed as goals for instruction. Critical vocabulary is identified and a variety of activities for both teaching and assessing skills are developed (Thompson et al., 2002).

In addition to curriculum mapping, classrooms that employ the strategy of thematic instruction are characterized by a variety of non-traditional approaches to teaching. Co-teaching and collaborative teaching may be employed as a model for delivery of the curriculum. Based on subject area expertise, teachers are paired with other teachers to create an integrated learning environment that is rich in the expertise of not only a single instructor but capitalizes on the knowledge of multiple experts. This integrated approach creates a resource-rich classroom for exploration. Including the use of technology as a tool for exploration heightens the quality of the instruction and equips students with the skills necessary to access information in a global society.

Thematic instruction may also employ the use of cooperative learning to support problem solving activities. Teachers design inquiry-based learning experiences by creating opportunities for students to use "hands-on, minds-on" activities to make sense of real world problems. By providing students with opportunities for choice within the activities, students become immersed in the learning experience and self-directed in their learning. Relating themes to authentic experiences strengthens the connections between content of the curriculum and the real world setting and extends the classroom into the neighborhood and community. By building fluency between school subjects and application of these subjects to

real world contexts, thematic instruction transforms a traditional approach to curriculum into a meaningful teaching and learning experience (NWREL, 2005).

Technology, Simulations and Games

Simulations and games offer teachers and students powerful new tools to enhance learning. This strategy creates opportunities for students to visualize and model concepts. Simulations allow learners the opportunity to model, explore, and try out a variety of strategies. Games inject a competitive edge that appeals to some students (NWREL, 2005). Moreover, simulations and games create a curiosity that in turn generates a demand for knowledge. When students discover knowledge through exploration, they connect ideas to develop a deep level of understanding. By combining experimentation, manipulation of media, and personal experience, students become intimately involved in the learning experience (Edelson, 1998).

With simulations, students work collaboratively to invent and experiment using multi-modal and non-linear methods to arrive at decisions. Structured by authentic rules, simulations permit learning to take on a functional rather than simply theoretical context. For example, students may engage in authentic experiences that would be too hazardous, impractical, or costly to perform in the classroom such as designing roller coasters, or performing CPR. While students are on the outside looking in, they are able to manipulate variables to generate a variety of different outcomes. The use of technology provides unprecedented experimental opportunities for learning. Simulation software is available to augment most all curricular areas as well as transport students into a virtual world with seemingly unending opportunities for exploration.

Finally, simulations in the form of games have gained acceptance as effective instructional tools. In fact, the new term, serious game, refers to gaming technology that relates to an academic goal rather than simply entertaining students. Not only have schools made gains in recognizing games as valid learning tools but major corporations, government institutions, and foundations are recognizing the benefits of technologically enhanced learning. New technological approaches to gaming have enhanced training and education in a multitude of disciplines.

Key research findings. According to Gordin and Pea (1995), the strategy of simulations and games holds a unique appeal to students and demonstrates effectiveness in enhancing learning. When students are able to represent and explore new information in science classrooms using modeling tools, they are able to explore and deepen their understanding as well as share it with others. This helps them understand the phenomena they are investigating (NWREL, 2005). Through simulation experiences, students have the capability of not only exploring and understanding subject content at a deep level, but also engaging in experiences that increase authentic skills such as crisis management, communication, problem solving, data management, and collaboration (Gredler, 1990).

Likewise, gaming strategies teach skills for competition, cooperation, teamwork, and conflict resolution (Neubecker, 2003). However, research indicates that to use gaming to enhance the effectiveness of the learning experience the games must simulate real life experiences. Moreover, the effective use of games varies depending on the academic content of the learning experience. Research indicates that gaming is most effective in the areas of mathematics, physics, and language arts rather than social studies, biology, and logic. In order to be effective like other learning opportunities, the specific content to be taught must

be identified by a teacher who must also precisely define the objectives to be accomplished in the gaming activities (Randel, Morris, Wetzel, & Whitehill, 1992).

Games have a universal appeal as they create an environment that is dynamic, intrinsically motivating, and encouraging high levels of involvement. In addition, games provide immediate feedback permitting students to learn from their mistakes and to make immediate corrections (Hood, 1997). As a result of this universal appeal, the research reveals that games are effectively used with all ages of individuals and serve a range of functions in education including tutoring, exploring and practicing skills, and attitude change. Moreover, games serve many functions such as tutoring, amusing, helping to explore new skills, promoting self-esteem, practicing existing skills, drilling existing skills, automatizing, or seeking to change an attitude (Dempsey, Rasmussen, & Lucassen, 1997).

Implications for the classroom. Although the use of simulations and games in the classroom setting is gaining acceptance, the potential for this strategy to enhance learning has barely been tapped. Through online resources, simulations and games are available to enhance the learning of skills and concepts in all curricular areas. For teachers who possess adequate technology skills and have an interest in incorporating simulation and games into the curriculum, the possibilities are infinite.

First, by using dynamic simulations to model complex systems, students develop an understanding of not only a single system but a complex maze of interdependence among systems. By using interactive software that allows students to manipulate variables within the context of the learning environment, students observe first-hand the impact of change. These dynamic simulations are student-centered and permit a vehicle for exploration of personal interest.

Second, the use of simulation and games permits students to be inserted into a safe virtual environment that replicates real life situations and problems. Within the safety of the virtual environment students can practice skills that are indigenous to success in the real world setting. This type of authentic learning experience is unprecedented in its ability to help students make decisions and experience the consequences of those decisions within the context of a safe educational environment. Development of critical thinking and problem solving skills is inherent to the outcome of simulated learning experiences.

Another benefit of simulations and games is found in the development of metacognitive skills. Through the use of simulations and games students are encouraged to escape their comfort zones, to get outside of themselves, and to explore new ways of learning. Simulations and games encourage students to employ a reflective quality to their learning. As students try various solutions to problems, they begin to evaluate the outcomes of their leaning with a high level of accuracy.

Finally, teachers can maximize the effectiveness of simulations and games by combining this strategy with other research-based strategies such as providing feedback, setting objectives, nonlinguistic representations of knowledge, cooperative learning, and homework and practice. In fact, well-planned and implemented simulations and games have overlapping qualities of multiple research-based strategies. Cooperative learning skills may be taught through simulation, role plays may be designed through simulations, and independent learning skills can be practiced through simulations.

Summary

The review of current educational literature supports the need for educators to become responsive to the demands of the 21st century. School districts across the nation are

responding to unprecedented expectations of accountability including increased standards for teachers to achieve highly qualified status, the expectation that data based decisions drive the use of scientific researched-based instructional strategies, and the mandate that all students achieve mastery level in language arts, math, and science by the year 2014. The goal of the No Child Left Behind Act of 2001 was for all teachers to achieve highly qualified status by the end of the 2005-2006 school year. This requirement was especially difficult for numerous school districts across the nation that are experiencing teacher shortages. In response to this crisis, state policies that guide teacher preparation programs have been revised to support improvements in teacher training both in traditional preparation programs as well as newly developed alternative certification programs.

As the pace of the world travels at unprecedented speeds and the shortage of highly qualified teachers persists, educators are challenged to engage in activities that not only fulfill the requirements of the law but also contribute to a quality educational program. School leaders must respond to this challenge by examining the process of change as they expand their roles to include change agents to facilitate improved educational outcomes for students. The recently developed field of educational science has established a strong scientific research base for proven and promising practices that serve to improve student performance. In spite of the abundant research on scientific research-based instructional practices, the research provides only limited evidence that educators have adjusted their instructional practices to include the use of scientific research-based instructional strategies. Research to determine the extent to which teachers use scientific research-based instructional strategies is necessary to contribute to the knowledge base on this topic as well as to inform law makers of progress in implementing educational policies.

Furthermore, this literature review has identified two noted programs of scientific research-based instructional strategies: *Strategic Instruction Model (SIM)* produced at the University of Kansas Center for Research on Learning (KU-CRL) and *Classroom Instruction that Works* published by Mid-Continent Research for Education and Learning (MCREL). While both programs meet the criteria for evidence-based practices, the *SIM* focuses primarily on the population of at-risk students including those with learning disabilities. The *Classroom Instruction that Works* model targets the broad population of all students. The scope of this study is to examine the broad use of instructional practices among all teachers without targeting specific high need populations. Therefore, strategies identified in the *Classroom Instruction that Works* model are more closely aligned with the focus of this proposed study and will be selected for a more thorough investigation. Chapter Three provides specific information as to the design and method recommended for this investigation.

CHAPTER THREE: RESEARCH METHODS

Chapter Three provides a summary of the research methods for this study including research design, population and sample, and instrumentation. In addition, specific data collection procedures for this study are detailed. This chapter concludes with a description of the data collection process and the statistical methods of data analyses that were used in the study.

This study examined perceived importance and extent of use of scientific research-based instructional strategies among West Virginia teachers. Furthermore, this study investigated the extent to which perceived importance and use of scientific research-based instructional strategies differs between highly qualified teachers and non-highly qualified teachers. The proposal was submitted to the Marshall University Institutional Review Board for the Protection of Human Subjects in Research for approval to conduct the research and approval for the study was granted (See Institutional Review Board Approval, Appendix B.) Data were analyzed with consideration to the instructional strategies employed by two groups of educators, those who are highly qualified and those who are non-highly qualified as defined in the No Child Left Behind Act (NCLB) of 2001.

Research Design for this Study

Based on the nature of the inquiry for this study, a descriptive research design was used. As implied by the name, the goal of descriptive research is to generate a careful description of particular educational phenomena. While the nature of descriptive research may be quantitative, qualitative, or mixed, this study incorporated a quantitative approach to data collection. The instrumentation for the study was a researcher-designed structured survey, *Instructional Strategies Inventory*.

Descriptive studies are designed with the goal of portraying an accurate profile of persons, events or situations (Gall, Borg, & Gall, 1996). This study is limited to the description of the sample population at one point in time. A descriptive approach requires extensive knowledge of the situation to be researched to ensure that information is gathered on the variables of interest. In this study, the variables were identified as the perceived importance and extent of use of scientific research-based instructional strategies as identified in the literature review. The highly qualified status of the participants was a third variable in the study. Historically, descriptive studies have contributed significant insight into the business of education. Moreover, descriptive research produces statistical information that appeals to policy makers and educators (Gall, Borg, & Gall, 1996).

The No Child Left Behind Act has proven to be a challenge for school districts to implement. After more than six years of the enactment and implementation of NCLB, little is known as to the extent to which educators are complying with the mandate for the use of scientific research-based instructional strategies. This gap in the literature suggests the need for research related to the mandate for the use of scientific research-based instructional strategies. Specifically, this study examined perceived importance and frequency of use of scientific research-based instructional strategies among West Virginia teachers.

The research questions for the study were as follows:

1) To what extent do West Virginia teachers perceive scientific research-based instructional strategies important in delivery of school curriculum?

2) To what extent do West Virginia teachers use scientific research-based instructional strategies in delivery of school curriculum?

3) To what extent does perceived importance of scientific research-based instructional

strategies differ between highly qualified and non-highly qualified West Virginia

teachers?

4) To what extent does use of scientific research-based instructional strategies differ

between highly qualified and non-highly qualified West Virginia teachers?

Population and Sample

The sample for this study was selected from teachers currently employed in the state

of West Virginia. To ensure an adequate sample for each group, participants were randomly

selected from a stratified sample of West Virginia teachers as identified by the West Virginia

Education Information System. The stratification for this study was based on the status of the

teacher: highly qualified or non-highly qualified. According to reports from the West

Virginia Department of Education, 21,625 teachers were employed full time for the 2005-06

school year.

A request was made to the West Virginia Board of Education to draw a stratified

sample of teachers who are reported to be highly qualified or non-highly qualified as defined

in NCLB. This information is considered public record and is published in compliance with

the NCLB requirement that permits parents to be informed about the qualifications of their

child's teachers. According to Gall et al. (1996), the *t*-test performed required a minimum

sample size of 386 between the two groups; however, a researcher-preferred sample size of

440 participants was established based on discussion with other researchers. Based on these

criteria, the sampling procedure was reasonably calculated to produce a more than adequate

group of participants for the study.

Data Collection Procedure and Instrumentation

The quality of descriptive research is highly dependent upon the instrumentation and observations (Gall et al., 1996). This study utilized a quantitative approach to data collection. As a result, data were obtained in a numerical form to describe the perceived importance of scientific research-based instructional strategies as well as the frequency of use of the strategies among West Virginia teachers.

In addition, a survey strategy was utilized for collecting data. The survey is more commonly used in quantitative research because its standardized, highly structured design is compatible with this approach. Furthermore, surveys are considered to be cost and time-efficient when sampling a population within a large geographic area (Robson, 1997) such as teachers across the state of West Virginia. A researcher-designed survey, the *Instructional Strategies Inventory (ISI),* was constructed and used specifically for the purpose of collecting data for this study. Participants provided self-report responses to items that queried the topic of scientific research-based instructional strategies. Design measures were taken to increase the chance of obtaining an accurate and unbiased assessment of the items being measured. A pilot was conducted for the survey which consisted of a sample of teachers employed in Kanawha County Schools, West Virginia's largest school district representing one tenth of the state's total population. Revisions were made as indicated by the pilot group. Internal consistency within strategies was assumed as the literature confirms that a scientific research base has been independently established for each instructional strategy queried.

The survey was carefully designed for attractiveness and user-friendly format with a goal of increasing the return rate. A cover letter was attached to provide a brief summary of the research and to communicate the importance of completing and returning the survey. (See

Survey Cover Letters, Appendix C.) Although requested information is non-threatening, care was taken to protect the confidentiality of the participants; however, in order to provide follow-up to non-respondents, the researcher used a coded system to track returns. A second mailing was completed to obtain an adequate number of replies, determined to be 50% plus one.

The *ISI* is a closed form survey and consists of a two-part questionnaire. To clarify the language used to describe instructional strategies, the survey included a brief description of each instructional strategy and examples for each strategy. Part I of the *ISI* contains a representative sample of scientific research-based instructional practices as defined in the literature review of this study. The questions are presented with regard to the perceived importance and use of specific instructional practices. A Likert Scale ranging from 1-4 is employed to measure the variables of perceived importance (1=not at all important; 2=somewhat important; 3=important; 4=critically important) and frequency of use (1=never; 2=occasionally; 3=weekly; 4=daily) of scientific research-based instructional strategies. In Part II, participants are asked to provide personal demographic information regarding programmatic level teaching assignment, estimated hours of training specific to scientific research-based instructional strategies, years of experience in education, gender, and age.

Data Analysis

Upon receipt of a sufficient number of survey responses, a minimum of 50% plus one, the data were analyzed using the appropriate statistical methods. Both descriptive statistics and inferential statistics were utilized; descriptive statistics are the values that describe the population or sample while inferential statistics are the tools used to infer the results based on a sample to a population. A non-parametric chi-square analysis was

performed to analyze the Likert scale data. Likert scale data were also transformed to numerical values to obtain interval data, characterized by equal distance between points (Salkind, 2004). In addition, demographic data were summarized using naturally occurring break points to obtain two groups for comparison of mean scores. Independent samples t-tests were performed using these transformed values to determine significance at the $p \leq .05$. A hypothesis of difference was assumed as data were analyzed within the categories of highly qualified by certification and the combination of highly qualified by HOUSSE and not highly qualified. Analysis was conducted based on individual item as well as summative data compiled from responses to the *ISI*. In addition, the results of the study were analyzed for statistical significance. Over the past two decades, data analysis has been augmented by the use of technology such as the Statistical Package for the Social Sciences Version 15 (SPSS) designed to analyze quantitative data (Gall et al., 1996). SPSS was employed to conduct the data analyses for this study.

Summary

The procedures presented in this chapter describe the researcher's methods of assuring that the study presents facts of empirical significance. The methods were designed to gather information regarding scientific research-based instructional strategies. This research was conducted in the state of West Virginia. A descriptive research design yielding quantitative data was utilized. The population for the study was West Virginia teachers while the stratified, random sample was drawn from the West Virginia Education Information System. Instrumentation consisted of a self-reported survey titled the *Instructional Strategies Inventory*. Data collected from this study were analyzed using the appropriate statistical test to describe the relationship between the variables of perceived importance and frequency of

use of scientific research-based instructional strategies and the highly qualified status of the

teacher.

CHAPTER FOUR: RESULTS

This chapter presents an analysis of the results of the study as determined by responses to the *Instructional Strategies Inventory (ISI).* The *ISI* is a two part researcher-designed survey. Part I probed the perception and use of scientific research-based instructional strategies. Part II of the *ISI* yielded demographic characteristics of the respondents. Data were collected and analyzed using quantitative methods. A descriptive research design was employed and descriptive statistical analyses were applied to the data obtained from the *ISI* to determine perceived importance and frequency of use for each scientific-research based instructional strategy probed. Furthermore, inferential statistical analyses were applied as evidence for generalizing the results to a population based on the survey sample. Data analyses of the results of this study were conducted using the Statistical Package for the Social Sciences Version 15 (SPSS), specialized computer software designed to analyze quantitative data.

The analyses of the data are divided into five sections. The first section provides a review of the population and sample selected for the study. The second section reports the demographic data collected from Part II of the *ISI* that were analyzed to identify significant patterns based on specific characteristics of respondents. The third section presents results from Part I of the *ISI* to determine the perceived importance and use of scientific research-based instructional strategies. This section is organized around the following research questions: 1) To what extent do West Virginia teachers perceive scientific research-based instructional strategies important in the delivery of school curriculum? 2) To what extent do West Virginia teachers use scientific research-based instructional strategies in delivery of school curriculum? 3) To what extent does perceived importance of scientific research-based

instructional strategies differ between highly qualified and non-highly qualified West

Virginia teachers? 4) To what extent does use of scientific research-based instructional

strategies differ between highly qualified and non-highly qualified West Virginia teachers?

The fourth section of this chapter concludes with a summary of the major findings of the

study. Finally, the fifth section details the ancillary findings for this study.

Population and Sample

The population for this study consisted of teachers employed in West Virginia public

schools pre-kindergarten through twelfth grades during the 2005-06 school year according to

the West Virginia Education Information System (N=21,625). Of the teachers employed,

13,677 (63%) were identified as highly qualified, 7,135 (33%) were considered highly

qualified by a High Objective Uniform State Standard Evaluation (HOUSSE), and 813 (4%)

were listed as non-highly qualified as defined in the No Child Left Behind Act of 2001. A

randomly selected stratified sample of 440 teachers yielded 279 (63%) identified as highly

qualified, 159 (37%) identified as non-highly qualified. The non-highly qualified group

includes 145 (33%) identified as qualified by HOUSSE and 14 (4%) identified as non-highly

qualified. Respondents to the *ISI* adequately reflect the stratified sample with 149 (65.1%)

highly qualified respondents and 80 (34.9%) non-highly qualified respondents. The non-

highly qualified group is comprised of 72 (31.4%) HOUSSE qualified respondents and 8

(3.5%) non-highly qualified respondents. Of the 440 teachers randomly selected to

participate in the study, an overall return of 229 responses or 52% was obtained with two

mailings. The first mailing resulted in the return of 142 (32%) responses to the *Instructional

Strategies Inventory.* A second mailing resulted in 87 additional responses representing a

20% response rate. While the mailings resulted in 229 returned surveys, the number of responses for each statement on the survey varied due to the nature of a self-report survey.

Major Findings for Perceived Importance and Use

This section presents major findings for the research questions identified in this study related to perceived importance and use of scientific research-based instructional strategies. Results were compiled based on self-reported responses to the *Instructional Strategies Inventory (ISI)*, a researcher-designed survey that yielded quantitative data to describe the perceived importance and use of scientific research-based instructional strategies among West Virginia teachers. Internal validity was established for the *ISI* by comparing the mean score for the single item probe for overall perceived importance (M= 3.11) with the mean score for all strategies probed for perceived importance (M=3.20) and the mean score for the probe for overall use of the strategies (M= 3.21) with the mean score for all strategies probed for frequency of use (M= 3.06). Part I of the *ISI* contains a representative sample of scientific research-based instructional practices as defined in the literature review of this study. Data analyses were conducted based on both single item analysis and summative data compiled from responses to the ratings for all probes for perceived importance and use of scientific research-based instructional strategies as reported on the *ISI*. The following analyses of results provided information in response to each research question.

Research Question One: To what extent do West Virginia teachers perceive scientific research-based instructional strategies important to delivery of school curriculum?

Part I of the *ISI* asked respondents to rate the overall perceived importance of the use of scientific research-based instructional strategies. A Likert Scale ranging from 1-4 was employed to measure the variable of perceived importance (1=not at all important;

2=somewhat important; 3=important; 4=critically important). A majority of respondents

reported their perception of scientific-research based instructional strategies as important

(M=3.21, SD=.48). Of the 229 respondents, 65 (28.4%) selected critically important, 125

(54.6%) selected important, 30 (13.1%) selected somewhat important, and 5 (2.2%) selected

not at all important. Four respondents (1.7%) did not indicate a rating. Table 7 shows the data

related to perceived importance of scientific research-based instructional strategies.

Table 7

Frequency of Reported Overall Perceived Importance of Strategies

Perceived Importance	Frequency	Percent
Not at all important	5	2.2
Somewhat important	30	13.1
Important	125	54.6
Critically important	65	28.4
Total	225	98.3

Research Question Two: To what extent do West Virginia teachers use scientific research-

based instructional strategies in delivery of school curriculum?

The overall use of scientific research-based instructional strategies is probed in Part I

of the *ISI*. A Likert Scale ranging from 1-4 was employed to measure the variable of

frequency of use (1=never; 2=occasionally; 3=weekly; 4=daily). Respondents most

frequently reported their use of scientific-research based instructional strategies as weekly

(M=3.06, SD=.42). Of the 229 respondents, 88 (38.4%) reported daily use, 100 (43.7%)

reported weekly use, 36 (15.7%) reported occasional use, and 2 (0.9%) reported no use.

Three respondents (1.3%) did not select a rating for use of scientific research-based

instructional strategies. Data for the frequency of use of scientific research-based

instructional strategies are displayed in Table 8.

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Table 8

Frequency of Reported Overall Use of Strategies

Reported Use	Frequency	Percent
Never	2	0.9
Occasionally	36	15.7
Weekly	100	43.7
Daily	88	38.4
Total	226	98.7

Research Question Three: To what extent does perceived importance of scientific research-based instructional strategies differ between highly qualified and non-highly qualified West Virginia teachers?

Participants for this study were randomly selected and stratified by highly qualified teacher status. The number of highly qualified and non-highly qualified teachers selected for the sample was determined by the naturally occurring percentages of each found in the total population of West Virginia teachers. Based on the definition of highly qualified teacher status in the No Child Left Behind Act of 2001, results reveal that 147 (64%) of the respondents were considered highly qualified and 81 (35%) were considered non-highly qualified. Respondents were asked to rate their overall perceived importance of scientific research-based instructional strategies using a Likert scale ranging from one (not at all important) to four (critically important). Numerical values were used to obtain mean scores. A mean score of M=3.18 (SD=.68) was reported for those teachers considered highly qualified while a mean score of M=2.99 (SD=.75) was reported for those teachers considered non-highly qualified. Group statistics for perceived importance based on the highly qualified status of the teacher are described in Table 9.

Table 9

Overall Perceived Importance of Strategies by Highly Qualified Teacher Status

Teacher Status	N	Mean	Std. Deviation
Highly Qualified	147	3.18	.679
Non-Highly Qualified	78	2.99	.747

Utilizing independent *t*-tests, mean scores were analyzed to compare the highly qualified status of the teacher and perceived importance of scientific research-based instructional strategies. Again, Likert scale data were assigned numerical values for analysis of mean scores. A two-tailed test of significance ($p =.056$, $df =223$) compared the mean scores of highly qualified teachers and non-highly qualified teacher, revealing no significant relationships between the highly qualified status of the teacher and the perceived importance of scientific research-based instructional strategies. Table 10 illustrates the results of the independent samples *t*-test.

Table 10

Results for Independent Samples t-Tests for Overall Perceived Importance of Strategies

T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Upper	Lower
1.925	223	.056	.190	.099	-.005	.384

$p \leq .05$

Finally, Likert scale data for perceived importance were analyzed using a non-parametric test as a second measure of significance. A chi-square analysis of the responses for perceived importance of scientific research-based instructional strategies was conducted using summative data. No significant difference was determined between highly qualified

and non-highly qualified teachers [$X^2(3)$=3.83, p =.28 or p>.05]. Table 11 details the results

of the chi-square analysis with regard to perceived importance of the strategies and the highly

qualified status of the teacher.

Table 11

Results of Chi-Square Tests for Perceived Importance of Strategies

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.832*	3	.281
N of Valid Cases	225		

* 2 cells (25.0%) have expected count less than 5. The minimum expected count is 1.75.
$p \leq .05$

Research Question Four: To what extent does use of scientific research-based instructional

strategies differ between highly qualified and non-highly qualified West Virginia teachers?

Likewise, both the highly qualified teacher group and the non-highly qualified teacher

group were asked to rate their use of scientific research-based instructional strategies using a

Likert scale ranging from one (never) to four (daily). Numerical values were used for

analysis of mean scores. A mean score of M=3.06 (SD=.42) was obtained indicating that

teachers most often report weekly use of the strategies. The summative analysis of teacher

responses to the use of scientific research-based instructional strategies reveals no significant

difference with regard to highly qualified status of the teacher and use of the strategies. A

mean score of M=3.27 (SD=.68) was obtained for teachers in the highly qualified status

group while a mean score of M=3.10 (SD=.83) was determined for teachers in the non-highly

qualified status group. Group statistics for frequency of use of scientific research-based

instructional strategies are found in Table 12.

Table 12

Overall Use of Strategies by Highly Qualified Teacher Status

Teacher Status	N	Mean	Std. Deviation
Highly Qualified	147	3.27	.678
Non-Highly Qualified	79	3.10	.826

Data for reported overall use of scientific research-based instructional strategies were also subjected to independent *t*-tests to analyze the relationship between highly qualified status of the teacher and frequency of use of scientific research-based instructional strategies. Again, Likert scale data were assigned numerical values for analysis of mean scores. A two-tailed test of significance (*p* =.10, *df* =224) compared the mean scores of highly qualified teachers and non-highly qualified teachers, revealing no significant difference between the highly qualified status of the teacher and the use of scientific research-based instructional strategies. Results of the independent samples *t*-tests describing the difference between groups are found in Table 13.

Table 13

Results for Independent Samples t-Tests for Overall Use of Strategies

T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Upper	Lower
1.671	224	.096	.171	.102	-.031	.372

p ≤ .05

As a second measure of significance, a non-parametric test was applied to the Likert scale data. Using summative data for frequency of use, a chi-square analysis revealed that no significant difference exists between highly qualified and non-highly qualified teachers and

their reported use of the strategies [$X^2(3)=6.95$, $p =.07$ or $p>.05$]. Table 14 provides the

inferential analysis for the frequency of use of scientific research-based instructional

strategies based on the highly qualified status of the teacher.

Table 14

Results of Chi-Square Tests for Use of Strategies

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.947*	3	.074
N of Valid Cases	226		

* 2 cells (25.0%) have expected count less than 5. The minimum expected count is .70.
$p \leq .05$

Finally, mean scores for each of the scientific research-based instructional strategies

were analyzed to determine which strategies respondents perceived as most important. An

independent samples test for equality of means revealed no significant differences ($p>.05$)

among the strategies probed with regard to perceived importance. Mean scores for highly

qualified teacher responses ranged from a high of M=3.40 for homework and practice to a

low of M=3.01 for thematic instruction with less than one-half point of variance. Mean

scores for non-highly qualified teacher responses ranged from a high of M=3.49 for

reinforcing effort to a low of M=2.99 for generating and testing hypotheses with one-half

point of variance. While mean scores for highly qualified teachers are observed to be slightly

higher than those for non-highly qualified teachers, the overall variance is limited indicating

no notable difference between the groups. With regard to perceived importance, a

comparison of the rank order of strategies in the MCREL *Classrooms that Work* model with

the rank order of strategies established in this study reveals a noted difference between the

order established by the MCREL scientific research base and the order that was reported in

this study. The comparison of these rank orders of means for perceived importance of each

strategy is reported by highly qualified and non-highly qualified teachers as listed in Table

15.

Table 15

Comparison of Rank Order of Means for Perceived Importance of Each Strategy as Reported by Highly Qualified/Non-Highly Qualified Teachers

MCREL Rank Order	Strategy	Study Rank Order	Teacher Status	N	Mean	Std. Deviation	Sig. (2-tailed)
1	Similarities/ Differences	4	Highly Qualified	147	3.3129	.61714	.24
		4	Non-Highly Qualified	80	3.2125	.60991	
2	Summarizing/ Note Taking	5	Highly Qualified	146	3.2397	.64653	.08
		7	Non-Highly Qualified	81	3.0741	.75462	
3	Reinforcing Effort	2	Highly Qualified	146	3.3699	.63260	.18
		1	Non-Highly Qualified	80	3.4875	.61611	
4	Homework/ Practice	1	Highly Qualified	146	3.3973	.63766	.07
		3	Non-Highly Qualified	78	3.2308	.68230	
5	Nonlinguistic Representation	6	Highly Qualified	146	3.2055	.64239	.41
		6	Non-Highly Qualified	79	3.1266	.75731	
6	Cooperative Learning	7	Highly Qualified	145	3.1793	.76075	.69
		5	Non-Highly Qualified	80	3.1375	.72468	
7	Generating Hypotheses	8	Highly Qualified	146	3.0753	.71521	.39
		8	Non-Highly Qualified	79	2.9873	.75945	
8	Cues/Question Organizers	3	Highly Qualified	146	3.3219	.65321	.61
		2	Non-Highly Qualified	80	3.2750	.67458	
Not Ranked	Thematic Instruction	Not Ranked	Highly Qualified	147	3.0068	.72619	.57
		Not Ranked	Non-Highly Qualified	79	3.0633	.70423	
Not Ranked	Technology/ Simulations	Not Ranked	Highly Qualified	147	3.1020	.71897	.52
		Not Ranked	Non-Highly Qualified	78	3.0385	.67309	

p ≤ .05

Finally, mean responses for each of the scientific research-based instructional

strategies were analyzed to determine which strategies respondents reported as most

frequently used. An independent samples test for equality of means revealed no significant

differences (*p*<.05) among the strategies probed with regard to frequency of use except for

the strategy of summarizing and note taking which was determined to be significant

(*p* =.001) when a two-tailed test of significance was applied. Mean scores for highly

qualified teacher responses ranged from a high of M=3.39 for reinforcing effort and providing recognition to a low of M=2.83 for generating and testing hypotheses with one-half point of variance. Mean scores for non-highly qualified teacher responses ranged from a high of M=3.40 for reinforcing effort to a low of M=2.59 for summarizing and note taking with less than one point of variance. A cursory review of the data reveal that mean scores for highly qualified respondents show a tendency to be higher than non-highly qualified respondents, the overall variance is limited indicating no significant difference between the groups. With regard to frequency of use, a comparison of the rank order of strategies in the MCREL *Classrooms that Work* model with the rank order of strategies established in this study reveals a noted difference between the order established by the MCREL scientific research base and the order that was reported in this study. The comparison of these rank orders of means for frequency of use for each strategy is reported by highly qualified and non-highly qualified teachers as listed in Table 16.

Table 16

Comparison of Rank Order of Means for Frequency of Use for Each Strategy as Reported by Highly Qualified/Non-Highly Qualified Teachers

MCREL Rank Order	Strategy	Study Rank Order	Teacher Status	N	Mean	Std. Deviation	Sig. (2-tailed)
1	Similarities/ Differences	4	Highly Qualified	147	3.1497	.65537	.59
		3	Non-Highly Qualified	80	3.2000	.71865	
2	Summarizing/ Note Taking	7	Highly Qualified	143	2.9720	.84707	.001
		8	Non-Highly Qualified	78	2.5897	.82864	
3	Reinforcing Effort	1	Highly Qualified	146	3.3904	.70831	.96
		1	Non-Highly Qualified	81	3.3951	.76940	
4	Homework/ Practice	2	Highly Qualified	146	3.3836	.69739	.17
		2	Non-Highly Qualified	79	3.2405	.83536	
5	Nonlinguistic Representation	6	Highly Qualified	146	3.0479	.70791	.98
		5	Non-Highly Qualified	78	3.0513	.92438	
6	Cooperative Learning	5	Highly Qualified	146	3.1027	.74027	.62
		6	Non-Highly Qualified	80	3.0500	.77786	
7	Generating Hypotheses	8	Highly Qualified	146	2.8288	.74611	.21
		7	Non-Highly Qualified	79	2.6962	.75709	
8	Cues/Question Organizers	3	Highly Qualified	146	3.2055	.70386	.58
		4	Non-Highly Qualified	80	3.1500	.74799	
Not Ranked	Thematic Instruction	Not Ranked	Highly Qualified	146	2.8699	.79882	.98
		Not Ranked	Non-Highly Qualified	79	2.8734	.83769	
Not Ranked	Technology/ Simulations	Not Ranked	Highly Qualified	147	2.9592	.85910	.33
		Not Ranked	Non-Highly Qualified	78	2.8462	.75725	

$p \leq .05$

Ancillary Data Analysis

The *Instructional Strategies Inventory* was utilized for collection of demographic data describing characteristics of respondents, including programmatic level of teaching assignment, estimated hours of training specific to scientific research-based instructional strategies, years of experience in education, gender, and age. This section provides a descriptive analysis of the demographic data gathered by the survey.

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Programmatic Level

Participants were asked to identify the programmatic level in which they taught during the 2005-06 school year. Responses were divided into three categories: pre-kindergarten/elementary, middle/junior, or high. Results of this survey indicated that a preponderance of the respondents identified themselves as pre-kindergarten/elementary teachers. Of the 229 respondents, 132 (59.2%) taught at the pre-kindergarten/ elementary level, 42 (18.8%) taught at the middle/junior high level, and 49 (21.4%) taught at the high school level. Six respondents (2.6%) did not select one of the programmatic level choices provided. Table 17 provides descriptive analysis of respondents by programmatic levels.

Table 17

Frequency of Reported Programmatic Levels

Programmatic Level	Frequency	Percent
Pre-Kindergarten-Elementary School	132	57.6
Middle-Junior High School	42	18.3
High School	49	21.4
Total	223	97.4

Estimated Hours of Training

Respondents were asked to indicate an estimate of the number of hours of training specific to scientific research-based instructional strategies in which they had participated as of the 2005-06 school year. Category choices included 0-3 hours, 4-8 hours, 9-12 hours, 13-16 hours, and 17 or more hours. Respondents most frequently reported participation in 17 hours or more of professional development related to scientific research-based instructional strategies. Specific responses to hours of training for the 229 respondents reveal that 92 (40.2%) indicated 17 hours or more, 29 (12.7%) indicated 13-16 hours, 56 (24.5%) indicated 9-12 hours, 26 (11.4%) indicated 4-8 hours and 20 (8.7%) indicated 0-3 hours. Six

respondents (2.6%) did not provide a response for hours of training. Table 18 depicts the

descriptive analysis of the estimated hours of training related to scientific research-based

instructional strategies as reported by participants in this study.

Table 18

Frequency of Reported Hours of Training

Hours of Training	Frequency	Percent
0-3 hours	20	8.7
4-8 hours	26	11.4
9-12 hours	56	24.5
13-16 hours	29	12.7
17 hours or more	92	40.2
Total	223	97.4

Years of Experience

Respondents were asked to indicate the total years of experience in education through

the 2005-06 school year. Categories of choices for years of experience included 1-6 years,

7-11 years, 12-20 years and 21 or more years. Of the 229 respondents, 127 (55.5%) reported

21 or more years of experience, 54 (23.6%) reported 12-20 years of experience, 31 (13.5%)

reported 7-11 years of experience, and 14 (6.1%) reported 1-6 years of experience. Three

respondents (1.3%) did not indicate a choice for years of experience. Displayed in Table 19

is the descriptive analysis of years of experience reported by the respondents.

Table 19

Frequency of Reported Years of Experience

Years of Experience	Frequency	Percent
1-6 years	14	6.1
7-11 years	31	13.5
12-20 years	54	23.6
21 years or more	127	55.5
Total	226	98.7

Gender

As part of the demographic characteristics, respondents were asked to indicate their

gender. Based on the report of the 229 respondents, a substantial number were identified as

female with 187 (81.7%) selecting this choice. Thirty-nine (17%) reported male as the choice

for gender and three (1.3%) did not report a choice for the category of gender. Table 20

presents data of responses for gender.

Table 20

Frequency of Reported Gender

Gender	Frequency	Percent
Male	39	17.0
Female	187	81.7
Total	226	98.7

Age

Respondents were asked to report their age during the 2005-06 school year. Choices

of categories included 21-30 years, 31-40 years, 41-50 years, and 51 years or older.

Respondents most frequently selected the category of 51 years or older to describe

themselves. Of the 229 respondents, 107 (46.7%) selected 51 years or older, 76 (33.2%)

selected 41-50 years old, 37 (16.2%) selected 31-40 years old, and 7 (3.1%) selected 21-30

years old. Two respondents (0.9%) did not make a selection. The demographic of age for

respondents in this study is reported in Table 21.

Table 21

Frequency of Reported Age

Age	Frequency	Percent
21-30 years old	7	3.1
31-40 years old	37	16.2
41-50 years old	76	33.2
51 years or older	107	46.7
Total	227	99.1

Demographic Comparisons for Perceived Importance and Use

Demographic data were analyzed to determine the correlation between specific characteristics of the sample and perceived importance and use of the strategies. These data were summarized using naturally occurring break points to obtain two groups for comparison of mean scores. Programmatic levels were divided into pre-kindergarten/elementary and secondary. Hours of training were divided based on one full day of training, eight hours or less and nine hours or more. Years of experience were divided into 11 years or less and 12 years or more. The category of age was divided into 21 years to 40 and 41 years or older. Independent samples *t*-tests were performed using these transformed values to determine significance at the $p \leq .05$. Data were summarized into two categories for each demographic to obtain two groups for comparisons. With regard to perceived importance of the strategies, a significant difference was determined for hours of training ($p = .002$), revealing that those teachers reporting nine hours or more of training reported an increase in perceived importance of the strategies. No significant difference between perceived importance and programmatic level, years of experience, age or gender were identified. Table 22 illustrates the results of the independent *t*-tests for queried demographics and perceived importance of the strategies.

Table 22

Independent t-Tests for Queried Demographics and Perceived Importance of Strategies

Queried Demographic	Perceived Importance (Mean Score)	Standard Deviation	Sig. (2-tailed)
Programmatic Level			
PreK / Elementary	3.11	.735	.76
Middle / Junior / High	3.15	.618	
Hours of Training			
0-8	2.84	.737	.002
9-17 or more	3.20	.668	
Years of Experience			
1-11	3.27	.654	.11
12-21 or more	3.08	.715	
Age			
21-30, 31-40	3.27	.624	.11
41-50, 51 or older	3.08	.722	
Gender			
Male	2.97	.636	.16
Female	3.15	.720	

$p \leq .05$

With regard to frequency of use of the strategies and specific queried demographics, a significant difference was determined for programmatic level ($p = .003$), hours of training ($p = .00$) and gender ($p = .00$). These results indicate an increase in the frequency of use for pre-kindergarten/elementary teachers when compared to middle and high school teachers. Results also indicated that teachers who participated in nine or more than 17 hours of training had an increase in the use of the strategies compared to teachers who participated in eight or less hours. In addition, results indicate that females are more likely than males to use the strategies. No significant difference between frequency of use and years of experience or age were identified. Table 23 illustrates the results of the independent *t*-tests for queried demographics and perceived importance of the strategies.

Table 23

Independent t-Tests for Queried Demographics and Frequency of Use of Strategies

Queried Demographic	Frequency of Use (Mean Score)	Standard Deviation	Sig. (2-tailed)
Programmatic Level			
PreK / Elementary	3.29	.721	.003
Middle / Junior / High	2.94	.755	
Hours of Training			
0-8	2.76	.743	.00
9-17 or more	3.33	.695	
Years of Experience			
1-11	3.20	.661	.93
12-21 or more	3.21	.755	
Age			
21-30, 31-40	3.25	.651	.71
41-50, 51 or older	3.20	.756	
Gender			
Male	2.74	.685	.00
Female	3.32	.705	

$p \leq .05$

Summary of Major Findings

This chapter presented the statistical analyses of the data collected from the

Instructional Strategies Inventory (ISI), a researcher-designed survey that was used as a tool

for probing the perceived importance and use of scientific research-based instructional

strategies. In addition, the *ISI* provided for the collection of selected demographic data for

characterizing the sample. Components of the *ISI* were constructed based on an in-depth

review of the literature on scientific research-based instructional strategies. The *ISI* was

provided to a random sample stratified based on the highly qualified status of the teachers as

determined by the requirements of the *No Child Left Behind Act of 2001*. Two hundred

twenty-nine respondents participated in the study, representing a 52% response rate. Analysis

of the results was conducted based on both individual item analysis and summative data

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compiled from responses to the *ISI*. Descriptive statistical analyses were applied to these data to determine frequency of responses. In addition, the results of the study were subjected to inferential statistics to determine statistical significance in generalizing the results to the population.

The core of this study was focused on four research questions:

Question One: To what extent do West Virginia teachers perceive scientific research-based instructional strategies important in delivery of school curriculum?

Major findings using descriptive analyses of responses provided a preponderance of evidence to support the importance of scientific research-based instructional strategies. Results revealed that 83% of the respondents perceived scientific research-based instructional strategies to be important or critically important, while 15.3% of the respondents indicated that scientific research-based instructional strategies were not at all important or somewhat important.

Question Two: To what extent do West Virginia teachers use scientific research-based instructional strategies in delivery of school curriculum?

Results of this study indicated that 82.1% of the respondents use scientific research-based instructional strategies daily or weekly while 16.6% of the respondents never or occasionally use of the strategies.

Question Three: to what extent does perceived importance of scientific research-based instructional strategies differ between highly qualified and non-highly qualified West Virginia teachers?

This question addressed the relationship between highly qualified teacher status and perceived importance of scientific research-based instructional strategies. Individual items

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for overall perceived importance as well as summative data for perceived importance revealed no significant relationship between highly qualified and non-highly qualified teachers with regard to perceived importance of scientific research-based instructional strategies. Furthermore, individual item analysis revealed little variance among the strategies with regard to perceived importance.

Question Four: To what extent does use of scientific research-based instructional strategies differ between highly qualified and non-highly qualified West Virginia teachers?

Individual items of frequency of use as well as summative data for frequency of use indicated no significant difference between highly qualified status of the teacher and frequency of use of scientific research-based instructional strategies. In addition, individual item analysis revealed little variance among the strategies with regard to frequency of use.

Summary of Ancillary Findings

In addition to data collected to explore the major research questions, demographic data to describe the sample were collected including programmatic level, hours of training in scientific research-based instructional strategies, years of experience, gender and age. An analysis of the demographic data obtained from the *ISI* revealed that a majority of the respondents (57.6%) were identified as pre-kindergarten/elementary teachers while 18.3% reported that they taught in a middle/junior high school and 21.4% taught at the high school level. A majority of the respondents (52.9%) reported that they had participated in 13 hours or more of professional development related to scientific research-based instructional strategies while 35.9% indicated a range of 4-12 hours of training. Only 8.7% of the respondents reported participation in 0-3 hours of training. With regard to years of experience, 55.5% classified themselves with 21 or more years of experience while 23.6%

reported 12-20 years of experience. In addition, 19.6% of the respondents reported 11 years or less of teaching experience. The sample was overwhelmingly female with 81.7% selecting the choice of female and 17.0% selecting male to describe gender. With regard to age, 46.7% of the respondents selected the category of 51 years or older to describe themselves while 33.2% chose the category of 41-50 years of age. Only 16.2% of the respondents reported their ages between 31-40 and only 3.1% indicated their ages between 21-30 years old.

Demographic data were also analyzed to determine the correlation between specific characteristics of the sample and perceived importance of scientific research-based instructional strategies. When applied to perceived importance of the strategies, independent *t*-tests for hours of training was the only demographic queried that revealed a significant difference ($p = .002$), indicating that teachers who participated in nine or more hours of training reported an increase in perceived importance of the strategies when compared to teachers who attended training for eight hours or fewer.

With regard to frequency of use, independent *t*-tests revealed a significantly higher use among pre-kindergarten/elementary teachers ($p = .003$) when compared to middle/high teachers. Furthermore, a significant difference was found between frequency of use and hours of training ($p = .00$) with teachers who participated in nine or more hours of training reporting an increase in use when compared to those who attended eight hours or fewer of training. Likewise, a significant relationship was found between frequency of use and gender ($p = .00$) with females reporting an increase in use of the strategies when compared to males.

Based on these analyses, the strategies were ranked for both perceived importance and frequency of use. Overall, the lack of a large degree of variance among the mean scores for perceived importance provided conclusive evidence that teachers did not express a

preference for some strategies over others. Likewise, overall, the lack of a large degree of

variance among the mean scores for frequency of use provided conclusive evidence that

teachers report a somewhat evenly distributed use of the strategies.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

Introduction

Current literature provides a strong base of evidence for the use of scientific research-based instructional strategies as best practices in education. The literature provides an equally strong evidence base for the quality of teaching in an effective learning environment (Archer, 2002; Noll, 2003). Furthermore, the premiere federal legislation, the No Child Left Behind Act of 2001 (NCLB), mandates the use of scientific research-based instructional strategies. However, NCLB fails to include the use of scientific research-based instructional strategies as a requirement for achieving highly qualified teacher status, instead relying only on the credentials of the teacher to determine teacher quality. The purpose of this chapter is to discuss the findings of this study with regard to the relationship between the highly qualified status of the teacher and perceived importance and frequency of use of scientific research-based instructional strategies among West Virginia teachers. Data for the study were collected by administering the *Instructional Strategies Inventory (ISI).* Based on the analyses of the data collected, conclusions are stated regarding the findings on perceived importance and frequency of use of scientific research-based instructional practices among West Virginia teachers. Recommendations for future research derived from the results of the *ISI* are also included.

Purpose of the Study

The purpose of the study was to examine the extent to which West Virginia public school teachers perceive the importance and use of scientific research-based instructional strategies as identified in the work of the Mid-Continent Regional Educational Laboratory (MCREL) and the extent to which perceived importance and frequency of use of scientific

research-based instructional strategies differ between highly qualified teachers and non-highly qualified teachers. These strategies include: identifying similarities and differences; summarizing and note taking; reinforcing effort and providing recognition; homework and practice; nonlinguistic representation; cooperative learning; generating and testing hypotheses; cues, questions, and advance organizers; thematic instruction; and technology, simulations, and games. Furthermore, this study sought to determine the extent to which perceived importance and use of scientific research-based instructional strategies differ between highly qualified teachers and non-highly qualified teachers.

Research Methods

This study incorporated a descriptive research design using a quantitative method to examine the perceived importance and use of scientific research-based instructional strategies. The population for this study consisted of 21,625 public school teachers in West Virginia. A stratified random sample of 440 participants was selected from the West Virginia Education Information System database. The sample was stratified based on the highly qualified status of the teacher. Of the 440 participants, 229 returned the survey, resulting in a 52% return rate. Return rates for each of the stratified groups revealed that respondents to the survey adequately reflected the sample as stratified by highly qualified and non-highly qualified.

Participants were asked to rate the extent to which they perceived the importance of scientific research-based instructional strategies and the extent to which they used scientific research-based instructional strategies in curriculum delivery. Data were collected using the *Instructional Strategies Inventory*, a closed form researcher-designed survey. Both

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descriptive and inferential analyses of the data were conducted using the Statistical Package for the Social Sciences.

Major Findings

This section presents major findings for the research questions identified in this study regarding the descriptive analyses of data for perceived importance and frequency of use of scientific research-based instructional strategies. Data analyses were conducted based on both individual items and summative data compiled from responses to all ten strategies probed for perceived importance and use of scientific research-based instructional strategies. The following analyses of results provide information in response to each research question.

Research Question One: To what extent do West Virginia teachers perceive scientific research-based instructional strategies important in delivery of school curriculum?

A descriptive analysis of the frequencies of responses to the query of perceived importance revealed that more than half of the respondents consider the strategies important (54.6%) while an additional one-fourth of the respondents (28.4%) stated that the strategies were critically important. These data provide a firm evidence base that West Virginia teachers perceive scientific research-based instructional practices as important, if not critically important, to a quality instructional environment. These findings are consistent with the work of the Mid-Continent Regional Educational Laboratory (MCREL) and Marzano, Pickering, et al. (2001) which identifies specific high-yield instructional strategies that are supported by a scientific research-base established through a meta-analysis of the literature.

Research Question Two: To what extent do West Virginia teachers use scientific research-based instructional strategies in the delivery of the school curriculum?

A descriptive analysis of responses for frequency of use of the strategies indicated that 43.7% of the respondents use scientific research-based instructional strategies weekly and an additional 38.4% of the respondents reported daily use of the strategies. These data provide strong evidence that more than four-fifths of West Virginia teachers incorporate the use of scientific research-based instructional strategies into classroom practices at least weekly, if not daily. Except for government reports, currently the literature is silent as to the extent of use of high yield instructional practices in classroom instruction. The findings of this study begin to establish a research base for the use of scientific research-based instructional strategies as required in the NCLB Act of 2001.

Research Question Three: To what extent does the perceived importance of scientific research-based instructional strategies differ between highly qualified and non-highly qualified West Virginia teachers?

Participants for this study were randomly selected and stratified by highly qualified teacher status. The item analysis of the probe for overall perceived importance revealed that a majority of the responses fell within the important and critically important categories (83%). For this item, a mean score of 3.22 (SD=.42) was reported for those teachers considered highly qualified, while a mean score of 3.21 (SD=.58) was reported for those teachers considered non-highly qualified. This finding indicated no significant difference between highly qualified and non-highly qualified teachers with regard to perceived importance of scientific research-based instructional strategies. Results of independent *t*-tests including a two-tailed test of significance revealed that, when comparing the mean scores for overall perceived importance, no significant difference was established between the highly qualified status of the teacher and the perceived importance of scientific research-based instructional

strategies (p =.07, df =224). Furthermore, an analysis of summative data from the ten items on the *ISI* that probed perceived importance of specific strategies was conducted as a second measure of the extent to which perceived importance of scientific research-based instructional strategies differ between highly qualified and non-highly qualified teachers. A chi-square analysis of these data confirms that no significant difference exists between highly qualified and non-highly qualified teachers and perceived importance of the strategies.

Based on the results of the individual item analysis and the analyses of summative data, strong evidence exists to support the finding of no significant difference between highly qualified teachers and non-highly qualified teachers when reporting perceived importance of scientific research-based instructional strategies. This finding suggests that, while landmark in nature, the NCLB legislation fails to define highly qualified teacher in a manner that results in a difference in practice between highly qualified and non-highly qualified teachers. Currently, NCLB defines highly qualified teacher in terms of credentials only which is supported by current literature (Darling-Hammond, 1998, 2000; Ferguson, 1991; Gewertz, 2002; Noll, 2003; U.S. Department of Education, 2005). However, this narrow definition fails to recognize an equally strong evidence base in the literature that supports teacher quality as the decisive factor in student learning (Archer, 2002; Center for Performance Assessment, 2005; Cochran-Smith, 2004; Darling-Hammond, 1998, 2000; Fuller, 1999; Gehring & Reid, 2001; Holland, 2001; Kennedy, 1998; Reeves, 2000; Noll, 2003; O'Day & Smith, 1993; Wright et al., 1997).

Research Question Four: To what extent does the use of scientific research-based instructional strategies differ between highly qualified and non-highly qualified West Virginia teachers?

Analysis of responses for the single item probing overall frequency of use of the strategies revealed that teachers most often reported weekly to daily use of the strategies (82.1%). A mean score of M=3.09 (SD=.41) was obtained for teachers in the highly qualified status group while a mean score of M=3.01 (SD=.43) was determined for teachers in the non-highly qualified status group with regard to frequency of use of the strategies. This finding indicated no significant difference between highly qualified and non-highly qualified teachers with regard to frequency of use of scientific research-based instructional strategies. Results of independent *t*-tests including a two-tailed test of significance revealed that, when comparing the mean scores for overall frequency of use, no significant difference was established between the highly qualified status of the teacher and frequency of use of scientific research-based instructional strategies (p =.10, *df* =224). Moreover, an analysis of summative data from the ten items on the *ISI* that probed specific strategies was conducted as a second measure of frequency of use of scientific research-based instructional strategies. A chi-square analysis ($X^2(3)$=6.70, *p* =.08 or *p*>.05) failed to establish a significant difference between the highly qualified status of the teacher and frequency of use of the strategies.

Based on the results of the individual item analyses as well as analysis of the summative data, no significant difference between highly qualified teachers and non-highly qualified teachers was found when examining frequency of use of scientific research-based instructional strategies. A review of the literature did not yield evidence related to the frequency of use of scientific research-based instructional strategies. Therefore, the results of this study will add to the body of knowledge by beginning to build an evidence base as to whether teachers who are considered highly qualified by the NCLB definition differ in their

use of scientific research-based instructional strategies when compared to non-highly qualified teachers.

Demographics

In addition to rating perceived importance and frequency of use of the probed strategies, participants were asked to report key demographic information. In terms of programmatic level, results revealed that overwhelming respondents described themselves as teaching at the pre-kindergarten/elementary programmatic level (132 or 59.2%) while reported programmatic levels for middle (42 or 18.8%) and high school (49 or 21.4%) were relatively evenly distributed. Moreover, additional data analysis revealed that with regard to programmatic level, pre-kindergarten/elementary teachers report more frequent use of the strategies when compared to middle/high teachers. This finding suggests that middle/high teachers may be more focused on the teaching of content rather than on the use of varied strategies for delivery of school curriculum.

When considering the demographic of gender, more than four-fifths of the respondents (187 or 81.7%) identified themselves as female, with only 39 (17%) selecting male as gender. In addition, data revealed that females report a significant increase in the use of the strategies when compared to males. This finding appears to support that gender is a defining demographic for increased use of the strategies. Gender also appears to be connected to the programmatic level demographic of respondents with a majority of respondents reported teaching at the pre-kindergarten/elementary programmatic level which is consistent with the observation that a majority of teachers assigned to the pre-kindergarten/elementary programmatic level are female.

Likewise, an uneven distribution of results was obtained in response to the estimated number of hours of training specific to scientific research-based instructional strategies. Ninety-two (40.2%) of the respondents reported that they had participated in 17 or more hours of relevant training while 56 (24.5%) indicated that they had participated in 9-12 hours of strategies training. The remaining categories for estimated number of hours of training were more evenly distributed with 29 (12.7%) indicating 13-16 hours, 26 (11.4%) indicating 4-8 hours and 20 (8.7%) indicating 0-3 hours. This finding confirms the efforts of school districts across the state to offer focused professional development opportunities with regard to the requirements of NCLB and the use of scientific research-based instructional strategies. Closer inspection of the data revealed that teachers who attended nine or more hours of training reported an increase in perceived importance when compared to teachers who attended eight or fewer hours. This finding suggests that teachers are likely to place more value on scientific research-based instructional strategies as a result of attending more hours of training and leads to the conclusion that high quality professional development is a critical component for bridging training to classroom practice.

Results of the query for years of experience for respondents revealed an aging teacher population. Of the 229 respondents, 127 (55.5%) reported teaching experience of 21 or more years while 54 (23.6%) reported 12-20 years of experience. Only 31 (13.5%) of the respondents reported 7-11 years of experience, and 14 (6.1%) reported 1-6 years of experience. Reports provided by respondents with regard to age also support the findings of an aging teacher population. Respondents most frequently selected the category of 51 years or older (107or 46.7%) with a steady decline in the age of teachers noted in subsequent categories, 76 (33.2%) selected 41-50 years old, 37 (16.2%) selected 31-40 years old, and

7 (3.1%) selected 21-30 years old. The finding of an aging population among West Virginia teachers is an interesting ancillary finding that is supported by current literature and mirrors a national trend. In fact, some school districts are currently experiencing a critical shortage of teachers in fields such as math, science, foreign language and special education (Gewertz, 2002). The National Center for Education Statistics predicts that, if current conditions are maintained, public education will need two million teachers by 2008 to meet the demand (Feistritzer, 2003).

Conclusions

The descriptive analysis of the data obtained from this study established an evidence base for drawing conclusions with regard to the perceived importance and frequency of use of scientific research-based instructional strategies. First, descriptive analyses of the frequencies of responses to the query of perceived importance revealed that teachers consider scientific research-based instructional practices as important, if not critically important, to the delivery of school curriculum. In fact, analyses of the data provide strong evidence with more than four out of five teachers employed in West Virginia schools during the 2005-06 school year reporting the strategies to be important or critically important to delivery of school curriculum. Second, data analyses of responses for frequency of use revealed an equally strong evidence base that teachers are using the strategies at least weekly, if not daily, in their classroom practice. Again, four out of five teachers employed in West Virginia schools during the 2005-06 school year reported weekly to daily use of the strategies.

The data from this study were also analyzed to determine whether the highly qualified status of the teacher makes a difference in the perceived importance and frequency of use of the strategies. With regard to perceived importance, results of this study support the

conclusion that no significant difference exists between highly qualified teachers and non-highly qualified teachers with regard to perceived importance of scientific research-based instructional strategies. Furthermore, results of this study lead to the conclusion that no significant difference exists between highly qualified and non-highly qualified teachers and their frequency of use of the strategies.

Further analyses of the data were conducted to examine the means for each of the ten scientific research-based instructional strategies probed on the *Instructional Strategies Inventory*. Based on these analyses, the strategies were ranked for both perceived importance and frequency of use. The lack of a large degree of variance among the mean scores for perceived importance provided evidence that teachers did not express a preference for some strategies over others. Furthermore, the lack of a large degree of variance among the mean scores for frequency of use provided conclusive evidence that teachers report a somewhat evenly distributed use of the strategies.

However, when the rank order of strategies for this study were compared with the rank order of strategies established by the MCREL research base, a gap between the literature and the practices reported in this study was noted. Marzano, Pickering, et al., (2001) and MCREL provide a ranking for eight of the ten strategies probed, excluding thematic instruction and technology, simulations and games. Based on empirical data the following rank order was established from the largest effect size to the smallest effect size: identifying similarities and differences; summarizing and note taking; reinforcing effort and providing recognition; homework and practice; nonlinguistic representation; cooperative learning; generating and testing hypotheses; and cues, questions, and advance organizers.

A comparison between the order of importance established by the MCREL research with the finding in this study reveals that teachers' responses for perceived importance in this study did not match the MCREL ranking of strategies based on effect size. When considering frequency of use, only three matches were noted with regard to nonlinguistic representations, cooperative learning, and generating and testing hypotheses. This disconnect between the established scientific research base and the results of this study lead to the conclusion that teachers base their perception of importance and frequency of use of the strategies on personal preference rather than on the established scientific research base. Furthermore, these results may be an indicator that teachers are more likely to utilize the "tried and true measures" by which they were taught in their school experiences such as lecture, reading, and written exercises, rather than select from new methods that have an established scientific research base.

Descriptive analyses of demographic data collected in the study include: programmatic level of teaching assignment, hours of training in the use of scientific research-based instructional strategies, years of teaching experience, age of the teacher, and gender. Significant ancillary findings related to programmatic level as well as hours of training suggest a need for an increase in the opportunities for teachers to participate in high quality professional development opportunities. Significant findings were identified for programmatic level with pre-kindergarten/elementary teachers reporting an increase in the use of scientific research-based instructional strategies when compared to middle/high teachers. In addition, significant findings were identified with regard to hours of training and an increase in perceived importance and use of the strategies. These findings suggest that targeted professional development that focuses on the merits of using scientific research-

based instructional strategies for all grade levels is needed for middle/high school teachers. Moreover, participation in an increased number of hours of professional development appears to be a key factor in connecting training to classroom practice. Teachers can no longer rely on the methods used when they were students if today's students are to be adequately prepared for success in the 21st century.

With regard to years of experience and age, the results of this study provide conclusive evidence of an aging teacher population across West Virginia. Nearly 80% of the work force report 12 to more than 21 years of experience while most respondents selected 51 years of age or older to describe themselves. These findings, while ancillary in nature, reflect the national trend of an aging work force in our schools (Gewertz, 2002; Feistritzer, 2003). Moreover, the aging teacher population gives rise to the need to recruit, train and retain an increased number of teachers if West Virginia schools are to have an adequate work force for the future.

Finally, information provided by the West Virginia Education Information System indicated that, for the 2005-06 school year, 63% of West Virginia teachers were considered highly qualified while 33% were identified as highly qualified by HOUSSE and 4% were identified as non-highly qualified. However, after the deadline for the federal reporting period for highly qualified teachers, the federal government declined approval of the West Virginia HOUSSE resulting in a designation of non-highly qualified for 37% of the teachers employed in the state. This information warrants the conclusion that more than one-third of the current work force in West Virginia is lacking in teaching credentials to be considered highly qualified for their teaching assignments. Furthermore, this finding reveals that West

Virginia continues to address the need to provide a highly qualified work force as described in NCLB.

Discussion and Implications

Passage of the No Child Left Behind Act of 2001 resulted in unprecedented changes in federal legislation that increased standards and accountability for the education of our youth, including the requirement that school districts employ a highly qualified teacher work force. Furthermore, NCLB requires the use of scientific research-based instructional strategies in the delivery of school curriculum. These challenges are mounted at a time when rapid globalization of the world is imminent. Educators are being asked to embrace these unprecedented changes and to act with urgency to create an education system that is responsive to the needs of our youth.

Appropriately, change theory serves as the theoretical framework for this study. As a result of the changes imposed by the NCLB legislation, schools must begin to understand the process of change as well as common barriers to change. Fullan (2004) identifies the crucial components of successful educational reform efforts as shared moral purpose, capacity building, ongoing learning, and demanding culture. Marzano, Waters, et al., (2005) refer to the necessity of first order and second order change to achieve substantive educational reform. However, this research acknowledges that first order change occurs more frequently but is rarely sustained while second order change occurs more rarely but more often results in substantive, meaningful reform.

The core of this study focuses on the NCLB requirements for the use of scientific research-based instructional strategies in classroom practice. This requirement has been informed by the effective schools research as well as the newly created field of educational

science. In addition, educational research focused on the importance of teacher credentials has informed the NCLB legislation. However, a disconnect between the literature and the NCLB requirements is asserted, as the definition for highly qualified teacher status relies only on the qualifications of the teacher and appears to ignore an equally strong body of evidence that supports the need for quality teaching in classroom practice. A second disconnect is identified between the requirements for the use of scientific research-based instructional strategies and the implementation of these strategies in the classrooms. This disconnect lies at the core of this study. Through a review of current literature, ten high-yield scientific research-based instructional strategies were identified for this study; through the use of a survey tool, this study examined the perceived importance and extent of use of the identified scientific research-based instructional strategies among West Virginia teachers. Furthermore, this study investigated the extent to which the perceived importance and use of scientific research-based instructional strategies differ between highly qualified teachers and non-highly qualified teachers.

Implications for National Reform

The NCLB Act of 2001 has served as the impetus for national education reform in the 21st century. Requirements of this legislation include employment of a highly qualified work force before the end of the 2005-06 school year and the incorporation of scientific research-based instructional strategies in classroom instruction. Descriptive analyses of the results revealed that NCLB has not resulted in the expected change in classroom instructional practices. More than six years after the enactment of NCLB, and one full year after the stated deadline for employing a highly qualified work force, one-third of West Virginia teachers remain non-highly qualified for their teaching assignments. Moreover, no evidence exists to

support that highly qualified status, as defined by the law, results in changes in classroom practices. In fact, results of this study indicate that regardless of highly qualified status, teachers perceive scientific research-based instructional strategies as important to the teaching and learning process. Furthermore, the results of this study reveal that regardless of highly qualified status, teachers use scientific research-based instructional strategies in delivery of school curriculum.

Based on these findings, implications of this research assert that lawmakers must expand the definition to include teacher quality practices as defined in the literature in the definition of highly qualified teacher. Many school districts across the nation have gone beyond the requirements in NCLB that limit highly qualified status to credentials alone. These districts have made strides to recognize the findings of the literature that underscore the teacher as the decisive factor in student learning. For example, Riverside Public Schools located in suburban Chicago requires teachers to provide evidence of attendance at relevant professional development sessions, scholarly endeavors such as publications, and involvement in community awareness projects that promote board initiatives in order to achieve highly qualified teacher status (Riverside Public School District 96, 2007).

Implications for State Reform

State education agencies are responsible for creating policies to direct and guide school districts within the state jurisdiction. However, federal legislation frames state policy. Thus, the increased requirements of the federally supported NCLB Act of 2001 have led to increased standards in state policies. In West Virginia, these increased accountability measures can be found in West Virginia Board of Education Policy 2510, Assuring the Quality of Education: Regulations for Education Programs, which establishes regulations for

education improvements related to teaching and learning; West Virginia Board of Education Policy 2520, Content Standards and Objectives for West Virginia Schools, which defines the content standards and objectives for the programs of study; and West Virginia Board of Education Policy 2419, Regulations for the Education of Exceptional Students, which provides guidance to county school systems in the administration and provision of special education services.

In addition to these policies that guide instruction, the West Virginia Board of Education is charged with the responsibility of determining standards for teacher preparation programs. West Virginia Board of Education Policy 5100, Approval of Educational Personnel Preparation Programs, establishes the process for institutions of higher education to follow in development, approval, and implementation of professional education programs leading to West Virginia licensure. Furthermore this legislation requires that higher education institutions develop written collaborative agreements with the public schools to provide professional preparation experiences that are research-based best practice and that result in increased student achievement. Finally, West Virginia Board of Education Policy 5202, Minimum Requirements for the Licensure of Professional/Paraprofessional Personnel and Advanced Salary Classifications including National Board for Professional Teaching Standards Certification Reimbursement/Salary Bonus Program, sets requirements for state licensure.

A review of these policies reveals that West Virginia has a strong foundation of policy that works within the framework of the federal legislation; however, local school districts are challenged to comply with increased requirements in the policies. West Virginia Board of Education Policy 2510 and Policy 2520 have recently been revised to include

increased rigor and requirements for the use of scientific research-based instructional practices. West Virginia Board of Education Policy 5202 has been revised to reflect the federal language describing highly qualified teacher status. Teacher shortages in critical fields have complicated the local school districts' ability to hire a highly qualified work force and the rejection of the state's HOUSSE has resulted in the need to redesign a system that provides for measures other than credentials to achieve highly qualified teacher status.

In response to this crisis, state policies that guide teacher preparation programs have been revised to support improvements in teacher training both in traditional preparation programs as well as newly developed alternative certification programs. In the sixth year of the implementation of NCLB, 63% of West Virginia teachers are considered highly qualified while 37% are considered non-highly qualified as defined in NCLB. With more than one-third of the state's teachers considered non-highly qualified, the state of West Virginia must take action to respond to the urgency to employ a highly qualified work force.

Furthermore, results of this study provided conclusive evidence that, like other school districts across the nation, West Virginia has an aging teacher population. Nearly 80% of the respondents in this study reported 12 to more than 21 years of experience while 46.7% or nearly half of the respondents selected 51 years of age or older to describe themselves. West Virginia policy provides some direction for the recruitment and retention of new teachers; however, efforts must be expanded if schools are to have adequate numbers of teachers to provide quality educational services.

Implications for Local School District Reform

The purpose of scientific research is to address the gap between research and practice. Mandates found in the No Child Left Behind (NCLB) Act of 2001 as well as West Virginia

state code require educators to use data to make decisions concerning the delivery of school curriculum including the use of instructional strategies that have a proven scientific research base to document their effectiveness with all students. Research conducted by Marzano, Pickering, et al. in conjunction with the Mid-Continent Regional Educational Laboratory (MCREL) has identified ten instructional strategies that are supported by empirical evidence for effectiveness with all students. This research, *Classroom Instruction that Works*, ranks the strategies based on effect size. Based on empirical data the following rank order is presented: identifying similarities and differences; summarizing and note taking; reinforcing effort and providing recognition; homework and practice; nonlinguistic representation; cooperative learning; generating and testing hypotheses; and cues, questions, and advance organizers.

Participants in this study were asked to rate perceived importance and frequency of use for ten strategies identified in the MCREL research. An examination of the range of mean scores for responses to these probes revealed only a minimal difference among the strategies for both importance and use. By ranking the strategies based on mean scores a comparison was made between results of this study and the rank list of strategies provided by MCREL. With regard to perceived importance, analysis revealed no exact matches between results of this study and the MCREL ranking of strategies. With regard to frequency of use, analysis revealed a match between results of this study and the MCREL ranking of strategies for only two strategies: nonlinguistic representation and cooperative learning.

A ranking of the strategies using mean scores for the highly qualified status of the teacher and their responses for each strategy revealed similar ranking regardless of the highly qualified status of the teacher. These results are important as they provide evidence that

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highly qualified teacher status has little impact on the use of scientific research-based instructional strategies. Based on this comparison, results of this study lead to the conclusion that West Virginia teachers' rank order for perceived importance of the strategies and the scientific evidence provided in the MCREL rank order differ.

Local school districts must assume the responsibility of planning high quality professional development opportunities that address scientific research-based instructional strategies. In fact, this study provides strong evidence that districts across the state are offering these opportunities with more than 77% of the teachers reporting at least nine hours of training related to scientific research-based instructional strategies. Moreover, results of this study provide evidence that teachers perceive the strategies to be important and that teachers are using the strategies in classroom practice. However, the extent of importance and use of the strategies appears to be based on teacher preference rather than the research base of evidence for each strategy. Local school districts continue to have a responsibility not only to provide targeted professional development but also to ensure that teachers gain an understanding of the field of educational science and explicitly incorporate this research into daily classroom practice.

Implications for Research and Theory

Indisputably, the No Child Left Behind Act of 2001 has sparked debate across the nation. The increased accountability measures and fears of sanctions that are associated with NCLB have left school districts challenged to take formidable actions. However, the spirit of the law, though lofty, is admirable. For the first time in history, federal legislation has called for equity in our schools. NCLB touts the dis-aggregation of data as well as requirements for the use of scientific research-based decision making as the tools for driving academic

improvement for students. Clearinghouses have been established to evaluate and filter programs and information to provide a "what works" resource to teachers and school districts. These efforts are unprecedented in the history of education.

While technical assistance is available for implementing the NCLB legislation, six years after the enactment little research exists to provide evidence of substantive change in educational practices. Quite possibly this law that is grounded in educational research is lacking in one essential component, an evaluation or assessment process to monitor the impact of the NCLB legislation. Current literature supports the premise that program evaluation and balanced assessment processes are essential to effective classroom practices but these tools can also be helpful in providing evidence of the effectiveness of major educational reforms. This research begins to build evidence of the changes that are occurring as a result of NCLB; however, with the reauthorization of NCLB rapidly approaching, urgency exists to provide research on the impact that the law has created to date. A robust education law requires a scientific research base that provides evidence of substantive educational reform.

Summary for Chapter Five

This study provided a descriptive analysis of the perceived importance and use of scientific research-based instructional strategies among West Virginia teachers. Results provided evidence that West Virginia teachers perceive scientific research-based instructional strategies as important to the teaching and learning process. Moreover, this study provided evidence that West Virginia teachers are using the strategies in classroom practice. However, results of the study also revealed no significant relationship between the perceived importance of the strategies and the highly qualified status of the teacher. With

regard to frequency of use, results were mixed as to the relationship between highly qualified status of the teacher and use of the strategies. Therefore, the findings suggest that by making achievement of highly qualified teacher status contingent on the use of scientific research-based instructional strategies, NCLB would reflect the importance of teacher quality by recognizing best practices as documented in educational research and would provide a foundation for powerful new legislation that underpins substantive educational reform.

The results of this study have implications for national, state, and local education reform as well as for research and practice. Implications for national reform call for law makers to examine the extensive body of research that supports teacher quality as the decisive factor in student learning and to respond to the results of this investigation by reauthorizing NCLB with powerful language that describes quality instruction. State reform efforts must focus on a collaborative work effort among the West Virginia Legislature, the West Virginia Department of Education and the institutions of higher education to recruit, train, and retain a highly qualified work force. Local school districts are charged with the responsibility to provide quality professional development opportunities that give teachers the tools to bridge the gap between research and daily classroom practice. Finally, results of this study have broad implications for research. Currently little research is available on the impact of the implementation of key requirements in the NCLB Act of 2001. Evaluation and assessment of the implementation is key to reauthorizing a law that will result in substantive educational reform.

Recommendations for Future Research

Educational research must be embraced as a major player in the changing complexion of our nation's schools. As Congress begins to struggle with the reauthorization of NCLB

legislation and as school districts continue to respond to the challenges of implementation of the current NCLB Act, reliance on high quality, scientific research-based evidence is key to the success of policy development and implementation. This study provides insight into the implementation of the current requirements of NCLB that focus on the use of scientific research-based instructional strategies. However, this research is limited in scope and raises questions that require further study. Recommendations for future research are as follows:

1) Conduct research that is designed for actual observation of scientific research-based instructional strategies. The *Instructional Strategies Inventory* is a tool designed to measure the perceived importance and frequency of use of scientific research-based instructional practices. However, respondents report their perceptions of importance and use, limiting the results of this study to self-reported data. Redesigning this study to incorporate a direct observation of scientific research-based instructional strategies would be a powerful complement to this research.

2) Conduct research on schools and school districts that are achieving the standards set in NCLB. Current literature provides a strong evidence base for identifying the qualities of effective schools. Moreover, the literature highlights the efforts of individual schools that achieve high standards. However, the literature is silent with respect to the impact that the implementation of NCLB has had on school improvement. Government reports reference improvements based on monitoring of accountability measures but little or no scientific research-based studies have been undertaken to document these effects.

3) Research effective teacher recruitment and retention programs. The increased standards in NCLB requiring a highly qualified work force come at a time when record numbers of teacher shortages are being predicted. Recruitment and retention of quality teachers is a critical part of the education reform effort. Ancillary findings of this research identify a need for aggressive recruitment and retention of quality teachers for West Virginia schools. Recruiting talented prospective teachers, providing quality pre-service education and training, and providing incentives for retaining these individuals is a complex process that requires coordination among institutions of higher education, state departments of education and public school districts. Additional research on successful approaches to recruiting, training and retaining a quality work force will assist states and local school districts across the nation with this effort.

4) Research effective professional development approaches. Public school districts are responding to the challenges facing education by spending unprecedented amounts of public and private funds on professional development programs. Furthermore, as a result of the increasing accountability, school districts are evaluating traditional forms of professional development to determine their effectiveness in improving educational practices. Recently MCREL has identified a research-based professional development framework that can assist with planning, implementing, and evaluating professional development experiences. However, a need exists for additional research on the effectiveness of this framework to determine if this approach subscribes to adult learning theory that results in bridging training to daily classroom practice.

5) Research HOUSSE efforts across the nation. The No Child Left Behind Act of
2001 allows for an alternative method for experienced teachers to demonstrate
subject-matter competency. The High Objective Uniform State Standard
(HOUSSE) option has been developed and used by states across the nation to
increase the number of teachers designated as highly qualified. At this time the
HOUSSE process for West Virginia is currently under revision. Research is
needed not only for West Virginia but for other states that are struggling to provide
alternative methods for achieving highly qualified teacher status without
compromising student outcomes.

6) Research effective processes that promote school reform within the framework of
change. Research on change theory has become paramount to educational reform.
Fueled by the technology revolution and rapid globalization of the world, change is
occurring exponentially. As a result schools are challenged to deliver effectiveness
within an ever changing environment. This dynamic requires school districts to
embrace urgency for change and engage in activities that promote first and second
order change. No longer can schools focus on achieving a certain product; by the
time the product is achieved, it is obsolete. Therefore, schools must focus on
processes for change. Research is needed to determine effective processes for
strategic planning that will lead the way for schools to engage in innovative
activities that result in substantive educational reform.

REFERENCES

Alexander, P., Schulze, S., & Kulikowich, J. (1994). How subject-matter knowledge affects recall and interest. *American Educational Research Journal*, *31*(2), 313-337.

Archer, J. (2002). Research: Focusing in on teachers. *Education Week, 21*(29), 36-39.

Armbruster, B., Anderson, T., & Ostertag, J. (1987). Does text structure/summarization instruction facilitate learning from expository test? *Reading Research Quarterly*, *22*(3), 331-346.

Atherton, J. (1998). Persona approach brings philosophers and students to life. *College Teaching*, *46*(1), 7-11.

Ausubel, D. (1960) The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology, 51,* 267-272.

Barton, K., & Smith, L. (2000). Themes or motifs? Aiming for coherence through interdisciplinary outlines. *Reading Teacher, 54*(1), 54-63.

Beane, J. (1997). *Curriculum integration: Designing the core of democratic education.* New York: Teachers College Press.

Bergeron, B., & Rudenga, E. (1996). Seeking authenticity: What is "real" about thematic literacy instruction? *Reading Teacher, 49*(7), 544-551.

Bransford, J., Brown, A., & Cocking, R. (1999). *How people learn*. Washington, DC: National Academy Press.

Brookbank, D., Grover, S., Kullberg, K., & Strawser, C. (1999). Improving student achievement through organization of student learning. ED435094 [action research dissertation].

Brown, A., Campione, J., & Day, J. (1981). Learning to learn: On training students to learn from texts. *Educational Researcher, 10,* 14-24.

Caine, R. & Caine, G. (1995). Reinventing schools through brain based learning. *Educational Leadership, 52*(7), 43-47.

Cameron, J. & Pierce, W. (1994). Reinforcement, reward, and intrinsic motivation: A meta-analysis. *Review of Educational Research*, *64*(3). 363-423.

Center for Performance Assessment (2005). Execution: Transforming research into action. Retrieved January 10, 2006, from

http://www.makingstandardswork.com/materials/customs/CA,%20Hayward,%20cust om,1.05,%20DR.ppt.pdf

Charp, S. (2003). Professional development. *T H E Journal (Technological Horizons In Education, 30*(11), 8.

Chen, Z. (1999). Schema induction in children's analogical problem solving. *Journal of Educational Psychology, 91*(4), 703-715.

Clements, D. & Nastasi, B. (1993) Electronic Media and Early Childhood Education, in B. Spodek (Ed.) *Handbook of Research on the Education of Young Children*, pp. 251-275. New York: Macmillan.

Cochran-Smith, M. (1997). Knowledge, skills, and experiences for teaching culturally diverse learners: A perspective for practicing teachers. In J. Irvine (Ed.). *Critical knowledge for diverse teachers and learners*. (pp.27-88) New York: AACTE Publications.

Cochran-Smith, M. (2004). Taking stock in 2004: Teacher education in dangerous times. *Journal of Teacher Education, 55*(1), 3-7.

Cohen, D. & Hill, H. (2000). Instructional policy and classroom performance: The

    mathematics reform in California. *Teachers College Record*, 102(2), 294–343.

Cole, J. & McLeod, J. (1999). Children's writing ability: The impact of the pictorial stimulus.

    Psychology in the Schools, 36(4) 359-370.

Coleman, J., Campbell, E., Hobson, C., McPartland, J., Mood, A., Weinfield, F., & York, R.

    (1966). *Equality of educational opportunity.* Washington, DC: U.S. Government

    Printing Office.

Comfort, L. (1997). Models of change: A dialogue between theory and practice. *American*

    Behavioral Scientist, 40(3), 259-263.

Cooper, H., Lindsay, J., Nye, B., & Greathouse, S. (1998). Relationships among attitudes

    about homework, the amount of homework assigned and completed, and student

    achievement. *Journal of Educational Psychology, 90*(1), 70-83.

Council for Exceptional Children [CEC] (2005). "Highly qualified" requirements for special

    educators. The Professional Standards and Practice Standing Committee, Retrieved

    July 8, 2005, from http://cec.sped.org/

Craske, M. (1985). Improving persistence through observational learning and attribution

    retraining. *British Journal of Educational Psychology, 55,* 138-147.

Daggett, W. (2005). Preparing students for their future. Retrieved January 10, 2006, from

    http://www.daggett.com/pdf/Preparing%20Students%20for%20Their%20Future%20

    6-05.pdf

Darling-Hammond, L. (1997). *The right to learn: A blueprint for creating schools that work.*

    San Francisco, CA: Jossey Bass.

Darling-Hammond, L. (1998). Teachers and teaching: Testing policy hypotheses form a

    national commission report. *Educational Researcher, 27*(1), 5-15.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state

    policy and evidence. Education Policy Analysis Archives, 8(1). Retrieved May 19,

    2004, from http://epaa.asu.edu/epaa/v8n1/

Dempsey, J., Rasmussen, K., & Lucassen, B. (1997). The instructional gaming literature:

    Implications and 99 sources. Technical Report 96-1, University of South Alabama,

    College of Education.

Edelson, D. (1998). Matching the design of activities to the affordances of software.

    Retrieved April 24, 2006, from http://citeseer.ist.psu.edu/edelson99addressing.html

Edmonds, R., & Fredrickson, J. (1979). Effective schools for the urban poor. *Educational*

    Leadership, 10, 23.

Elmore, R., & Zenus, V. (1994). Enhancing social emotional development of middle school

    gifted students. *Roeper Review, 16*(3), 182-185.

Essex, N. (2005). *School law and the public schools: A prActical guide for educational*

    leaders. Boston: Pearson.

Feistritzer, E. (2003). *Alternative certification: A state-by-state analysis 2003*. Washington,

    D.C.: National Center for Education Information.

Ferguson, R. (1991). Paying for public education: New evidence on how and why money

    matters. *Harvard Journal of Legislation*, *28*. 466-498.

Fermanich, M. (2002). School spending for professional development: A cross-case analysis

    of seven schools in one urban district. *The Elementary School Journal, 103*(1), 27-51.

Fillippone, M. (1998). *Questioning at the elementary level*. Master's thesis, Kean University. (ERIC Document Reproduction Service No. ED 417 421).

Fowler, T. (1975). *An investigation of the teacher behavior of wait-time during an inquiry science lesson*. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Los Angeles. (ERIC Document Reproduction Service No. ED 108 872).

Frederick, C., & Kovalik, S. (2004a). *A review of test scores for ten comprehensive school reform sites after two years implementing integrated thematic instruction*. Retrieved February 26, 2004, from http://www.kovalik.com/intsummaries.htm

Frederick, C., & Kovalik, S. (2004b). *Scores are soaring at Texas CSR sites*. Retrieved February 26, 2004, from http://www.kovalik.com/intsummaries.htm

Fullan, M. (1991). *The new meaning of educational change.* New York: Teachers College Press.

Fullan, M. (2000). The three stories of education reform. *Phi Delta Kappan, 81*(8), 581-588.

Fullan, M. (2004). *Leading in a culture of change.* San Francisco, CA: Jossey-Bass.

Fuller, E. J. (1999). *Does teacher certification matter? A comparison of TAAS performance in 1997 between schools with low and high percentages of certified teachers.* Austin, TX: University of Texas at Austin, Charles A. Dana Center.

Gall, M., Borg, W., & Gall, J. (1996). *Educational research: An introduction (6th ed.)*. White Plains, NY: Longman Publishers.

Gallagher, J. (2004). On being a survivor. *Roeper Review, 27*(1), 17.

Gardner, H. (1993). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.

Gehring, J. & Reid, K. (2001). Reports in three states urge policies to boost teacher supply,

    quality. *Education Week, 20*(16). Retrieved July 15, 2003, from

    http://www.edweek.org

Gentner. D., & Markman, A. (1994). Structural alignment in comparison: No difference

    without similarity. *Psychological Science*, *5*, 152-158.

Gewertz, C. (2002). Dayton feels the heat from charter schools. *Education Week, 21*(32).

    Retrieved July 15, 2003, from http://www.edweek.org

Gordin, D., & Pea, R. (1995). Prospects for visualization as an educational technology.

    Journal of the Learning Sciences, 4(3), 249-279.

Gredler, M. (1990) Analyzing deep structure in games and simulations. *Simulations/Games

    for Learning 20*(3), 329-34.

Griffith, J. (2003). Schools as organizational models: Implications for examining school

    effectiveness. *The Elementary School Journal, 104*(1), 29-48.

Grossen, B. (1996). What does it mean to be a research-based profession? Retrieved

    February 3, 2006, from http://darkwing.uoregon.edu/~bgrossen/pubs/resprf.htm

Guskey, T. (2002). Does it make a difference? Evaluating professional development.

    Educational Leadership, 59(6), 45-51.

Hidi, S., & Anderson, V. (1987). Providing written summaries: Task demands, cognitive

    operations, and implications for instruction. *Reviewing Educational Research*, *56*,

    473-493.

Holland, R. (2001). How to build a better teacher. *Policy Review, 106*, 37-47.

Hood, P. (1997). Simulation as a tool in education research and development. EdTalk: US.

      Retrieved May 3, 2005, from

      http://www.msu.edu/mkennedy/publications/docs/NISE/NISE.pdf.

Hyerle, D. (1996). Thinking maps: Seeing is understanding. *Educational Leadership, 53*(4),

      85-89.

Individuals with Disabilities Education Improvement Act of 2004, H.R. 1350. Retrieved May

      3, 2005, from http://www.ed.gov/policy/specced/guid/idea/idea2004.html

Information Center on Disabilities and Gifted Education. History of special education.

      Council for Exceptional Children. Retrieved April 20, 2005, from

      http://ericec.org/faq/spedhist.html

Jenks, C., Smith, M., Ackland, H., Bane, J., Cohen, D., Grintlis, H., Heynes, B., &

      Michelson, S. (1972). *Inequality: A reassessment of the effects of family and schools*

      in America. New York: Basic Books.

Jensen, E. (1998). *Teaching with the brain in mind.* Alexandria, VA: Association for

      Supervision and Development.

Jensen, E. (2000). Moving with the brain in mind. *Educational Research, 58*(3), 34-37.

Johnson, D. W., & Johnson, R. T. (1999). *Learning together and alone: Cooperative,*

      competitive, and individualistic learning. Boston: Allyn & Bacon.

Keith, T. & Cool, V. (1992). Teaching models of school learning: Effects of quality of

      instruction, motivation, academic coursework, and homework on academic

      achievement. *School Psychology Quarterly, 7*, 209-226.

Kennedy, M. (1998). Form and substance in inservice teacher education. Research

  monograph no. 13. Madison, WI: National Institute for Science Education. Retrieved

  May 1, 2006 from http://www.wcer.wisc.edu/archive/nise/

Kovalik, S., & Olsen, K. (1994). *ITI: The model: Integrated thematic instruction (3rd ed.).*

  Kent, Washington: Books for Educators, Covington Square.

Lacina-Gifford, L., & Gifford, R. (2004). Putting an end to the battle over homework.

  Education, 125(2), 279-281.

Lezotte, L. (1992). *Creating the total quality effective school*. Okemos, Michigan: Effective

  Schools Products, Ltd.

Lindblom, C. (1997). Initiating change: Modes of social inquiry. *American Behavioral*

  Scientist, 40(3), 264-276.

Madden, N., & Slavin, R. (1983). Effects of cooperative learning on the social acceptance of

  mainstreamed academically handicapped students. *Journal of Special Education, 17*,

  171-182.

Marzano, R., Norford, J., Paynter, D., Pickering, D., & Gaddy, B. (2001). *A handbook for*

  classroom instruction that works. Alexandria, VA: Association for Supervision and

  Curriculum Development.

Marzano, R., Pickering, D., & Pollock, J. (2001). *Classroom instruction that works:*

  Research-based strategies for increasing student achievement. Alexandria, VA:

  Association for Supervision and Curriculum Development.

Marzano, R., Waters, T., & McNulty B. (2005). *School leadership that works: From*

  research to results. Aurora, Co: Mid-Continent Research for Education and Learning

  (MCREL).

Mason, L. & Sorzio, P. (1996). Analogical reasoning in restructuring scientific knowledge. *European Journal of Psychology of Education, 11*, 3-23.

McAdams, R. (1997). A systems approach to school reform. *Phi Delta Kappan, 78*(2), 138-142.

Medin, D., Lynch, E., & Solomon, K. (2000). Are there kinds of concepts? *Annual Review of Psychology, 51*, 121-147.

Medin, D., Goldstone, R., & Markman, K. (1995). Comparison and choice. Relations between similarity processes and decision processes. *Psychonomic Bulletin & Review, 2*(1), 1-19.

Meyer, B. & Freedle, R. (1984). Effects of discourse type on recall. *American Education Research Journal, 21*, 121-144.

Morrison, J. (2004). Where now for problem based learning? *The Lancet, 363*(9403), 174.

National Commission on Excellence in Education. (1983) A nation at risk. Washington, DC: U.S. Department of Education. Retreived January 5, 2006, from http://www.ed.gov/pubs/NatAtRisk/index.html

National Council of Teachers of Mathematics [NCTM]. (2000). *Principles and standards for school mathematics.* Reston, VA: Author.

Neubecker, M. (2003) Simulation as an instructional tool. Encyclopedia of Educational Technology. San Diego, CA: San Diego State University. Retreived December 12, 2003, from http://coe.sdsu.edu/eet/articles/simulations/index

Newman, F., King, M., & Youngs, P. (2000). Professional development that addresses school capacity: Lessons from urban elementary schools. *American Journal of Education, 108*(4), 259-285.

Noll, J. (2003). *Taking sides: Clashing views on controversial educational issues.* Gilford, Connecticut: McGraw-Hill.

NWREL [Northwest Regional Educational Laboratory] (2005). *Focus on effectiveness.* Retrieved March 30, 2006, from http://www.netc.org/focus/strategies/

Nye, P., Crooks, T., Powlie, M., & Tripp, G. (1984). Student note taking related to university examination performances. *Higher Education,* 13(1), 85-97.

O'Day, J. & Smith, M. (1993). Systemic reform and educational opportunity. In S. Fuhrman (Ed.) *Designing coherent education policy: Improving the system.* New York: Jossey-Bass.

Oakes, J. (1985). *Keeping track: How schools structure inequality.* New Haven, CT: Yale University Press.

Odom, S., Brantlinger, E., Gersten, R., Horner, R., Thompson, B., & Harris, K. (2005). Research in special education: Scientific methods and evidence-based practices. *Exceptional Children, 71*(2), 137-148.

Ogle, D. (1986). K-W-L group instructional strategy. In A. S. Palincsar, D. S. Ogle, B. F. Jones, & E. G. Carr (Eds.), *Teaching reading as thinking* (Teleconference Resource Guide, pp. 11-17). Alexandria, VA: Association for Supervision and Curriculum Development.

O'Melia, M. & Rosenburg, M. (1994). Effects of cooperative homework teams on the acquisition of mathematics skills by secondary students with mild disabilities. *Exceptional Children, 60,* 538-548.

Parrish, T. (1996). Special education finance: past, present and future. Center for Special

 Education Finance, Policy paper number 8, May 1996. U.S. Department of

 Education, Office of Special Education Programs.

Qin, Z., Johnson, D., & Johnson, R. (1995). Cooperative versus competitive efforts and

 problem solving. *Review of Educational Research*, *65*(2) 129-143.

Randel, J., Morris, B., Wetzel, C., & Whitehill, B. (1992). The effectiveness of games for

 educational purposes: a review of recent research. *Simulation and Gaming*, *23*(3),

 261-276.

Redfield, D., & Rousseau, E. (1981). A meta-analysis of experimental research on teacher

 questioning behavior. *Review of Educational Research, 51*(2), 237-245.

Reeves, D. (2000). *Accountability in Action: A blueprint for learning organizations* (2nd ed.).

 Denver: Advanced Learning Press. Retrieved March 20, 2006, from

 http://www.makingstandardswork.com/Downloads/AinAChp19.pdf

Reyna, V. (2002). *The use of scientifically based research in education*, U.S. Department of

 Education. Retrieved February 26, 2004, from

 http://www.ed.gov/NCLB/methods/whatworks/research/transcript.pdf

Reynolds, D. & Packer, A. (1992). School effectiveness and school improvement in the

 1990's in D. Reynolds and P. Cuttance (Eds.) *School Effectiveness: Research, Policy*

 and PrActice, London: Cassell.

Risner, G., Nicholson, J., & Webb, B. (1994). Levels of comprehension promoted by the

 Cooperative Integrated Reading and Composition (CIRC) Program. Florence:

 University of North Alabama. (ERIC Document Reproduction Service No. ED 381

 751).

Riverside Public School District 96 (2007). Riverside School District Home Page. Retrieved March 5, 2007, from http://www.district96.org/

Robson, C. (1997). Real world research: A resource for social scientists and practitioner-researchers. Cambridge, MA: Blackwell Publishers, Ltd.

Roemischer, J. (2002). Spiral Dynamics: The eight-stage spiral of development. *What Is Enlightenment? 22*, 108-126.

Rosenthal, R. (1991). *Meta-analytic procedures for social research*. Newbury Park, CA: Sage.

Ross, J. (1988). Controlling variables: A meta-analysis of training studies. *Review of Educational Research, 58*(4), 405-437.

Rubinstein, G. (2003). Teacher boot camp. *Education Week, 22*(41), 43. Retrieved July 20, 2003, from http://www.edweek.org

Salkind, N. (2004). *Statistics for people who think they hate statistics*. Thousand Oaks, CA: Sage.

Sanders, W. & Horn, S. (1994). The Tennessee value-added assessment system (TVAAS): Mixed-model methodology in educational assessment. *Journal of Personnel Evaluation in Education, 8*(3), 299-311.

Savery, J., & Duffy, T. (1995). Problem based learning: An instructional model and its constructivist framework. *Educational Technology, 35*(5), 31-37.

Schlechty, P. (1990). *Schools for the 21st century: Leadership imperative for educational reform.* San Francisco: Jossey-Bass.

Seligman, M. (1994). *What you can change and what you can't.* New York: Alfred A. Knopf.

Siegel, C. (2005). Implementing a research-based model of cooperative learning. *The Journal of Educational Research*, *98*(6), 339-349.

Simplicio, J. (2005). Homework in the 21st century: The antiquated and ineffectual implementation of a time honored educational strategy. *Education, 121*(1), 138-147.

Slavin, R. (1993). Ability grouping in middle grades: Achievement effects and alternatives. *Elementary School Journal, 93*(5), 535-552.

Solomon, I. (1995). Analogical transfer and "functional fixedness" in the science classroom. *Journal of Educational Research, 87*(6), 371-377.

Stevens, R. & Slavin, R. (1995). The cooperative elementary school: Effects of student's achievement, attitudes, and social relations. *American Educational Research Journal, 32*(2), 321-351.

Strategic Instruction Model [SIM]. (2006). University of Kansas, Center for Research on Learning. Retrieved May 1, 2006, from http://www.ku-crl.org/sim/index.html

Sugai, G., & Horner, R. (2002). Introduction to the special series on positive behavior support in schools. *Journal of Emotional and Behavioral Disorders, 10*(3), 130-135.

Swink, D. (1993). Role-play your way to learning. *Training & Development, 47*(5), 91-97.

Taylor, B. (2002). The effective schools process: Alive and well. *Phi Delta Kappan, 83*(5), 375.

Thompson, M., Thompson, J., & Thompson, S. (2002). *Catching kids up: Accelerating learning.* Boone, NC: Learning-Focused Solutions, Inc.

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

U.S. Department of Education. (2005). *No Child Left Behind*: Expanding the promise.

    Retrieved April 20, 2005, from

    http://www.ed.gov/print/about/overview/budget/budget06/NCLB/index.html

U.S. Department of Education. (2006a). *Education Science Reform Act of 2002*. Retrieved

    April 24, 2006, from http://www.ed.gov/policy/rschstat/leg/PL107-279.pdf

U.S. Department of Education. (2006b). *Institute of Education Sciences: Regional*

    Educational Laboratories. Retrieved April 24, 2006, from

    http://www.ed.gov/news/pressreleases/2006/03/03282006.html

U.S. Department of Education. (2006c). *What Works Clearinghouse.* Retrieved April 24,

    2006, from http://www.whatworks.ed.gov/whoweare/overview.html

Van Overwalle, F., & De Metsenaere, M. (1990). The effects of attribution-based

    intervention and study strategy training on academic achievement in college

    freshmen. *British Journal of Educational Psychology, 60*, 299-311.

Walberg, H. (1999). Productive teaching. In H. Waxman & H. Walberg (Eds.), *New*

    directions for teaching prActice and research, 75-104. Berkeley, CA: McCutchen

    Publishing Corporation.

West Virginia Department of Education Board Policy 2419 (2002). Regulations for the

    Education of Exceptional Students. Title 126, Series 16. Retrieved March 20, 2005,

    from http://wvde.state.wv.us/policies/p2419.html

West Virginia Department of Education Board Policy 2510 (2005). Assuring the Quality of

    Education: Regulations for Education Programs. Title126, Series 42. Retrieved March

    20, 2005, from http://wvde.state.wv.us/policies/p2510.html

West Virginia Department of Education Board Policy 2520 (2003). Content Standards and

    Objectives for West Virginia Schools. Title 126, Series 44A. Retrieved March 20,

    2005, from http://wvde.state.wv.us/policies/p2520.1_ne.doc

West Virginia Department of Education Board Policy 5100 (2005). Approval of Educational

    Personnel Preparation Programs. Title 126, Series 114. Retrieved March 20, 2005,

    from http://wvde.state.wv.us/policies/p5100.html

West Virginia Department of Education Board Policy 5202 (2005). Minimum Requirements

    for the Licensure of Professional/paraprofessional personnel and advanced salary

    classifications. Title 126, Series 136. Retrieved March 20, 2005, from

    http://wvde.state.wv.us/policies/p5202.html

West Virginia State Department of Education (1998). *Responsible Students Through School-*

    wide Positive Behavior Supports, Charleston, West Virginia.

Wiersma, U. (1992). The effects of extrinsic reward on intrinsic motivation: A meta-analysis.

    Journal of Occupational and Organizational Psychology, 65, 101-114.

Winkleman, M., Deming, W., Coyne, K., Patterson, M., Martin, B., Galinsky, E., Libey, D.,

    Welington, S., Hess, S., Trout, J., Juran, J., Saffo, P., Wood, G., Luther, D., Hammer,

    M., & Ellsworth, D. (1993). Time to do or die: Strategic planning for the 1990s.

    Journal of Business Strategy, 14(5), 18-28.

Wright, S., Horn, S., & Sanders, W. (1997). Teacher and classroom context effects on

    student achievement: Implications for teacher evaluation. *Journal of Personnel*

    Evaluation in Education, 11(1), 57–67.

APPENDICES

Appendix A: Survey Instrument – Instructional Strategies Inventory

Appendix B: Institution Review Board Approval Letters

Appendix C: Survey Cover Letters

APPENDIX A: INSTRUCTIONAL STRATEGIES INVENTORY

INSTRUCTIONAL STRATEGIES INVENTORY

The Instructional Strategies Inventory (ISI) is a tool used to examine the perceived importance of and extent to which scientific research-based instructional strategies are used in the instructional process. Please circle a single response for each item that best describes your experience with each of the strategies during the past school year (August 2005-June 2006). The ISI takes approximately ten minutes to complete.

Part I

Item 1: Similarities and Differences
The instructional practice of identifying similarities and differences engages students in the mental process of identifying ways concepts, ideas, or objects are alike and different. Examples of instructional activities include: recognizing patterns, comparing and contrasting, creating metaphors, and constructing analogies.

How important do you perceive the use of similarities and difference in instruction?	1 Not at All Important	2 Somewhat Important	3 Important	4 Critically Important
To what extent have you used the strategy of similarities and differences for instruction?	1 Never	2 Occasionally	3 Weekly	4 Daily

Item 2: Summarizing and Note Taking
The instructional practice of summarizing and note taking enhances the students' ability to synthesize information while note taking helps students to organize information in a way that captures the main ideas and supporting details. Examples of instructional activities include: paraphrasing text, rule-based summarizing, reciprocal teaching, teacher-modeling of note taking, and teaching note taking formats such as outlining or Carnegie.

How important do you perceive the use of summarizing and note taking in instruction?	1 Not at All Important	2 Somewhat Important	3 Important	4 Critically Important
To what extent have you used the strategy of summarizing and note taking in instruction?	1 Never	2 Occasionally	3 Weekly	4 Daily

Item 3: Reinforcing Effort and Providing Recognition
The instructional practice of reinforcing effort and providing recognition helps students to understand how beliefs and attitudes can influence academic success. Examples of instructional activities include: explicit teaching of the connection between effort and performance; obtaining student commitment to increasing personal effort to school work; using literature and biographies of heroes who have a rags to riches story; using a multi-sensory approach to appeal to students with what effort looks like, sounds like, feels like; using visual representation of effort such as individual/class effort graphs or logs; using a system of rewards and effective praise; and using the pause, prompt and praise strategy for recognition.

How important do you perceive the use of reinforcing effort and providing recognition in instruction?	1 Not at All Important	2 Somewhat Important	3 Important	4 Critically Important
To what extent have you used the strategy of Reinforcing effort and providing recognition in instruction?	1 Never	2 Occasionally	3 Weekly	4 Daily

Item 4: Homework and Practice
The instructional practice of homework and practice provides students an opportunity to learn on their own by applying new knowledge. Examples of instructional activities include: memorization of important information; practice to increase speed so that students can efficiently apply skills to complex problem solving; deepening and expanding knowledge; and perquisite skills or preparation for a future activity.

How important do you perceive the use of homework and practice in instruction?	1 Not at All Important	2 Somewhat Important	3 Important	4 Critically Important
To what extent have you used the strategy of homework and practice in instruction?	1 Never	2 Occasionally	3 Weekly	4 Daily

Item 5: Nonlinguistic Representation of Knowledge
The instructional practice of nonlinguistic representation of knowledge involves the use of nonlinguistic representations in instruction to enhance students' ability to represent and elaborate on knowledge using mental images. Examples of instructional activities include: visual imagery; multiple intelligences (music, rhythm, dance and song); kinesthetic or whole-body modes (movement, simulations, and role play) ; scaffolding; graphic organizers; pictographs; and multimedia presentations.

How important do you perceive the use of nonlinguistic representation of knowledge in instruction?	1 Not at All Important	2 Somewhat Important	3 Important	4 Critically Important
To what extent have you used the strategy of nonlinguistic representation of knowledge in instruction?	1 Never	2 Occasionally	3 Weekly	4 Daily

Item 6: Cooperative Learning
The instructional practice of cooperative learning involves groups of students working together to complete a common task. Examples of instructional activities include: informal, formal, and base groups; think-pair-share; and lab groups.

How important do you perceive the use of cooperative learning in instruction?	1 Not at All Important	2 Somewhat Important	3 Important	4 Critically Important
To what extent have you used the strategy of cooperative learning in instruction?	1 Never	2 Occasionally	3 Weekly	4 Daily

Continue on Back

Item 7: Generating and Testing Hypotheses The instructional strategy of generating and testing hypotheses involves the use of thinking and reasoning skills to explore a problem. Examples of instructional activities include: systems analysis, problem solving, historical investigation, invention, experimental inquiry, decision making, problem finding, and problem based learning.				
How important do you perceive the use of generating and testing hypotheses in instruction?	**1** **Not at All** **Important**	**2** **Somewhat** **Important**	**3** **Important**	**4** **Critically** **Important**
To what extent have you used the strategy of generating and testing hypotheses in instruction?	**1** **Never**	**2** **Occasionally**	**3** **Weekly**	**4** **Daily**
Item 8: Cues, Questions and Advance Organizers The instructional strategy cues, questions and advance organizers draws the focus of instruction to essential information and helps students to organize their prior knowledge as a tool for preparing to learn new information. Examples of instructional activities include: use of explicit cues and refined questioning techniques; analytic questioning; expository advance organizers such as stories that relate to real-world events to personalize learning; skimming and scanning techniques; graphic organizers; and strategies such as KWL; LINK or Directed Reading/Thinking.				
How important do you perceive the use of cues, questions and advance organizers in instruction?	**1** **Not at All** **Important**	**2** **Somewhat** **Important**	**3** **Important**	**4** **Critically** **Important**
To what extent have you used the strategy of Cues, questions and advance organizers in instruction?	**1** **Never**	**2** **Occasionally**	**3** **Weekly**	**4** **Daily**
Item 9: Thematic Instruction The instructional strategy of thematic instruction focuses on the use of a theme that links the conceptual context of learning under a central idea. Examples of instructional activities include: integrating content, curriculum mapping, and relating themes to authentic student experiences.				
How important do you perceive the use of thematic instruction?	**1** **Not at All** **Important**	**2** **Somewhat** **Important**	**3** **Important**	**4** **Critically** **Important**
To what extent have you used the strategy of thematic instruction?	**1** **Never**	**2** **Occasionally**	**3** **Weekly**	**4** **Daily**
Item 10: Technology, Simulations and Games The instructional strategy creates opportunities for students to visualize and model concepts using new technologies enhanced learning and creates a curiosity that in turn generates a demand for knowledge. Examples of instructional activities include: on-line research, problem solving tools, virtual models, projects, and competitive activities.				
How important do you perceive the use of technology, simulations, and games in instruction?	**1** **Not at All** **Important**	**2** **Somewhat** **Important**	**3** **Important**	**4** **Critically** **Important**
To what extent have you used the strategy of technology, simulations, and games in instruction?	**1** **Never**	**2** **Occasionally**	**3** **Weekly**	**4** **Daily**
Item 11: Overall Rating The No Child Left Behind Act of 2001 and the Individuals with Disabilities Education Improvement Act of 2004 require the use of scientific, research-based instructional practices in the delivery of curriculum.				
Overall, how important do you perceive the use of scientific, research-based instructional strategies?	**1** **Not at All** **Important**	**2** **Somewhat** **Important**	**3** **Important**	**4** **Critically** **Important**
Overall, to what extent have you used scientific, research-based instructional strategies in instruction?	**1** **Never**	**2** **Occasionally**	**3** **Weekly**	**4** **Daily**

Part II
Complete the following information based on your teaching assignment
for the past school year (August 2005-June 2006).

Programmatic Level:	
_____Pre K-Elem	_____Middle/Junior _____High
Estimated hours of training specific to scientific research-based instructional strategies: _____0-3 hours _____4-8 hours _____9-12 hours _____13-16 hours _____17 or more hours	
Years of experience in education: _____1-6 _____7-11 _____12-20 _____21 or more	
Gender: _____Male _____Female	**Age:** _____ 21-30 _____31-40 _____41-50 _____51 or older

Return the ISI in the enclosed, stamped, and addressed envelop.

APPENDIX B: INSTITUTIONAL REVIEW BOARD APPROVAL

Cheryl D. Belcher
820 Echo Road
South Charleston, West Virginia
Email: cdbelche@access.k12.wv.us

Dear West Virginia Educator:

You have been selected to participate in a doctoral research study to examine the perceived importance and extent of use of scientific research-based instructional strategies among West Virginia teachers. As you are aware, current legislative trends pertaining to the use of scientific research-based instructional strategies under the *Individuals with Disabilities Education Improvement Act of 2004* and the *No Child Left Behind Act of 2001* have increased the accountability for teachers to be proficient in providing quality academic instruction. Furthermore, state and local education agencies across the nation are challenged to review accountability standards and teacher expectations to ensure a quality, highly qualified teaching workforce.

I realize that your time is precious. The attached survey, *Instructional Strategies Inventory (ISI)*, will take less than ten minutes to complete. Participation is voluntary and your responses are confidential. Data will be securely stored and will be reported in aggregate form only with no identification of individual responses. Your responses are very important to this research and your timely participation is valued. However, there is no penalty for declining to participate in this study.

The *ISI* will assist in gaining a better understanding of the needs of West Virginia educators as we strive to meet the high accountability standards required by federal policies. If you would like to accept the invitation to participate, please complete the enclosed *Instructional Strategies Inventory*. Directions for recording your responses are provided at the top of the *ISI*. Return the completed *ISI* in the enclosed, stamped, and addressed envelop. Please keep this letter for your records.

If you have any questions or would like further information on this study, you may contact me at 304-744-4139. If you have questions about your rights as a research subject, you may contact Dr. Stephen Cooper, IRB#2 Chair, Office of Research Integrity, Marshall University at 304-696-7320.

Thank you in advance for your participation in this study to assist with gaining a better understanding of the use of scientific research-based instructional strategies across the State of West Virginia.

Sincerely,

Cheryl Belcher
Doctoral Candidate, Marshall University

SDC **MU IRB**

IRB APPROVAL EXPIRES
DEC 12 2007

DEC 1 3 2006

APPROVED

West Virginia

Department of Education

December 8, 2006

Marshall University Graduate College
Institutional Review Board
100 Angus E. Peyton Drive
South Charleston, WV 25303

To Members of the Institutional Review Board:

I have reviewed the dissertation research titled *A Descriptive Analysis of the Use of Scientific Research-based Instructional Strategies Among West Virginia Teachers* proposed by Cheryl Belcher and have given approval for the research to be conducted using data from the West Virginia Education Information System. I have requested that the results of this research be shared with key members of the West Virginia Department of Education.

If you need additional information, contact me at 558-3762.

Sincerely,
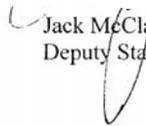
Jack McClanahan
Deputy State Superintendent of Schools

APPENDIX C: COVER LETTERS ACCOMPANYING SURVEY

Cheryl D. Belcher
Email: cdbelche@access.k12.wv.us

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Thank you in advance for your participation in this study to gain a better understanding of the use of scientific research-based instructional strategies across the State of West Virginia.

Sincerely,

Cheryl Belcher
Doctoral Candidate, Marshall University

Cheryl D. Belcher
Email: cdbelche@access.k12.wv.us

Dear West Virginia Educator:

Voice your opinion. You still have time to comment on the *No Child Left Behind* requirements for the use of scientific research-based instructional strategies. Your responses are very important to this research and your timely participation is valued.

You have been selected to participate in a doctoral research study to examine the perceived importance and extent of use of scientific research-based instructional strategies among West Virginia teachers. As you are aware, current legislative trends pertaining to the use of Scientific Research–based Instructional Strategies under *Individuals with Disabilities Education Improvement Act 2004* and the *No Child Left Behind Act of 2001* have increased the accountability for teachers to be proficient in providing quality academic instruction. Furthermore, state and local education agencies across the nation are challenged to review accountability standards and teacher expectations to ensure a quality, highly qualified teaching workforce.

I realize that your time is precious. The attached survey, *Instructional Strategies Inventory (ISI)*, will take less than ten minutes to complete. Participation is voluntary and your responses are confidential. Data will be securely stored and will be reported in aggregate form only with no identification of individual responses. There is no penalty for declining to participate in this study.

The *ISI* will assist in gaining a better understanding of the needs of West Virginia educators as we strive to meet the high accountability standards required by federal policies. If you would like to accept the invitation to participate, please complete the enclosed Instructional Strategies Inventory. Directions for recording your responses are provided at the top of the ISI. Return the completed ISI in the enclosed, stamped, and addressed envelop. Please keep this letter for your records.

If you have any questions or would like further information on this study, you may contact me at 304-xxx-xxxx. if you have questions about your rights as a research subject, you may contact Dr. Stephen Cooper, IRB#2 Chair, Office of Research Integrity, Marshall University at 304-696-7320.

Thank you in advance for your participation in this study to gain a better understanding of the use of scientific research-based instructional strategies across the State of West Virginia.

Sincerely,

Cheryl Belcher
Doctoral Candidate, Marshall University

CHERYL D. BELCHER

cdbelche@access.k12.wv.us

PROFESSIONAL GOAL
To obtain a leadership position working with school improvement issues within the West Virginia Department of Education—Leadership Center for 21st Century Schools.

CERTIFICATION
West Virginia State Certifications: Elementary Education 1-8
                                      Mental Retardation K-12
                                      Behavior Disorder Including Autism K-12
                                      Specific Learning Disabilities K-12

EDUCATION
　　　2007   Marshall University Graduate College, South Charleston, West Virginia
　　　Ed.D., Curriculum and Instruction—Anticipated May 2007
　　　2004   Marshall University Graduate College, South Charleston, West Virginia
　　　Ed.S., Curriculum and Instruction
　　　1984   West Virginia College of Graduate Studies, Institute, West Virginia
M.A., Special Education, Behavior Disorders
　　　Additional coursework in elementary curriculum content, learning disabilities, and special education: 32 hours
　　　1976   Marshall University, Huntington, West Virginia
A.B., Elementary Education, Mental Retardation
　　　Graduated cum laude

PROFESSIONAL EXPERIENCE
2006 - present **Coordinator, Superintendent's Center for 21st Century Schools**, WVDE
　　　　　　Member of state department of education team for designing leadership for the 21st century as well as development of 21st century model schools.
1997 - 2006 **Special Education Curriculum Specialist**, Kanawha County Schools, Charleston, WV.
　　　　　　Duties include county-wide coordination and management of all aspects of curriculum for special education program including learning disabilities, behavior disorders, mental impairment, autism, and gifted services; teacher training; selection and evaluation of curriculum materials; problem-solving challenging issues related to specific student individual education plans
2004 – 2006 **Adjunct Instructor, Marshall University**, South Charleston, WV.
　　　　　　Office of Professional Development. Duties include teaching both undergraduate and graduate level courses in Positive Behavior Supports offered through Kanawha County Schools.
2001 - 2006 **Director, Extended School Year**, Kanawha County Schools, Charleston, WV.

　　　　　　Duties include hiring, training, and evaluating all professional and para-professional staff; coordinating delivery of special education and related services; managing budget
1993 – 1997 **Special Education Process Specialist**, Kanawha County Schools, Charleston, WV.

Duties included coordination of special education services for mentally impaired, behavior disordered, learning disabled, and gifted students for George Washington High School and feeder schools attendance area

1992 – 1996 **Adjunct Instructor, Supervisor of Summer Practicum**, WVCOGS, Institute, WV.

Duties included verification of teacher competencies in areas of behavior disorders, mental impairment, and specific learning disabilities

1989 – 1993 **Program/Process Specialist, Behavior Disorders and Other Health Impaired (autism)**, Kanawha County Schools, Charleston, WV.

Duties included coordination of special education services for the behavior disordered and autistic including Cabell Alternative School, Kanawha Home for Children, and Highland Hospital Children's Unit

1981 – 1989 **Teacher, Behavior Disorders**, Staunton Elementary School, South Charleston, WV.

Duties included working with kindergarten to third grade students identified as behavior disordered

Screening Referral Agent, Staunton Elementary School, South Charleston, WV.

Duties included coordinating county/school student referral process

1983 – 1986 **Teacher, Extended School Year**, Owens School, Kanawha County Schools, Charleston, WV.

Duties included working with students identified as severely behavior disordered with autistic-like characteristics

Shawnee Hills Day Training Center, Charleston, WV.

Duties included working with profoundly and trainable mentally impaired students who had multiple handicaps including physical, visual, and hearing impairments

1980 – 1981 **Teacher, Multicategorical Resource Room**, South Charleston High School, South Charleston, WV.

Duties included working with students identified as mildly handicapped in the areas of mental retardation, specific learning disabilities, or behavior disorders.

1978 – 1980 **Teacher, Mental Retardation**, Woodrow Wilson Junior High School, Charleston, WV.

Duties included working with junior high students identified as mentally impaired

RELEVANT SPECIALIZED TRAINING

- **Advisory Board Member** – Autism Training Center, Vice-chair, Marshall University
- **Cadre Member** – State-wide Positive Behavior Support Training Cadre, Chairperson for Southern Area
- **Cadre Member** – Teacher Interventions and Positive Supports (TIPS). West Virginia State Department of Education
- **Supervisor** – SRA Corrective Reading Direct Instruction Program
- **Facilitator** – Instructional Strategies for Co-teaching Workshop
- **Trainer** – Classroom Instruction that Works (Marzano)
- **Participant** – Curriculum Mapping and Team Planning (McCrel)
- **Competitive Grant Recipient** – Greater Kanawha Valley Foundation and various West Virginia Department of Education Discretionary Grants
- **Provisional Associate Trainer** – *Keys to Innervision*, a cognitive restructuring program for adolescents
- **Certified Instructor** – International Crisis Prevention Institute, crisis management strategies
- **Trained Supervisor** – SRA Corrective Reading Direct Instruction—Decoding and Comprehension
- **Facilitator** – *Planning Alternative Tomorrows with Hope* (PATH). A state-wide training team to conduct futures planning for individuals with disabilities
- **Facilitator** – *Connections: A KCS Professional Development Series For Middle Level Educator,* a four day workshop focused on curriculum mapping and team planning
- **Director** – *Treasures and Challenges: A Curriculum Initiative for Special Educators*
- **Publication** – In *CEC Today*, a quarterly journal sponsored by the Council for Exceptional Children
- **Presenter** – *Conversations*, an interagency conference for service providers for individuals with disabilities, Kanawha County Schools and RESA III
- **Presenter** – Annual conference of the West Virginia Council for Exceptional Children
- **Presenter** – International Conference of the Council for Exceptional Children
- **Workshop** – Evaluation of Professional Personnel, West Virginia State Department of Education
- **Participant** – Grant Writing Workshop, Kanawha County Schools
- **Workshop Series** – University of Kansas SIMS Learning Strategies, RESA III
- **Committee** – Curriculum development project, *Annual Goals and Objectives for Students with Disabilities*, Chairperson, Kanawha County Schools
- **Committee** – Science / Health Program of Studies, Kanawha County Schools
- **Committee** – Language Arts, Math, Science, Social Studies textbook screening and selection, Kanawha County Schools.

PROFESSIONAL MEMBERSHIPS
- National Education Honorary
- Delta Kappa Gamma
- National Council for Exceptional Children
- National Council for Exceptional Children with Behavior Disorders
- West Virginia Council for Children with Behavior Disorders. Secretary 1987, 1991
- Marshall University Autism Training Center Advisory Board. 1995-present. Vice President 1999-present
- West Virginia Federation of the Council for Exceptional Children, Vice President, 2001-2002; President, 2002; Executive Board Member, 2001 - present

SUMMARY OF PROFESSIONAL DEVELOPMENT
- Sponsor of Crisis Intervention Training
- Sponsor of Special Education Curriculum Workshops
- Sponsor of SRA Corrective Reading Workshops
- Participant in Cultural Diversity, Sexual Harassment and Bullying Workshops
- Participant in Curriculum and Instruction Planning Meetings
- Participant in Technology in Education Workshops