

LISTENING TO EARLY CAREER TEACHERS:
HOW CAN ELEMENTARY MATHEMATICS METHODS COURSES BETTER
PREPARE THEM TO UTILIZE STANDARDS-BASED PRACTICES IN THEIR
CLASSROOMS?

by

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B.S.E., Kansas State Teachers College (Emporia State University), 1972
M.S.E., Kansas State Teachers College (Emporia State University), 1980

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Curriculum and Instruction
College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2010

Abstract

This study was designed to gather input from early career elementary teachers with the goal of finding ways to improve elementary mathematics methods courses. Multiple areas were explored including the degree to which respondents' elementary mathematics methods course focused on the NCTM Process Standards, the teachers' current standards-based teaching practices, the degree to which various pedagogical strategies from mathematics methods courses prepared preservice teachers for the classroom, and early career teachers' suggestions for improving methods courses.

Both qualitative and quantitative methodologies were used in this survey study as questions were of both closed and open format. Data from closed-response questions were used to determine the frequency, central tendencies and variability in standards-based preparation and teaching practices of the early career teachers. Open-ended responses were analyzed to determine patterns and categories relating to the support of, or suggestions for improving, elementary mathematics methods courses.

Though teachers did not report a wide variation in the incorporation of the NCTM Process Standards in their teaching practices, some differences were worth noting. Problem Solving appeared to be the most used with the least variability in its frequency of use. Reasoning, in general, appeared to be used the least frequently and with the most variability. Some aspects of Communication, Connections and Representation were widely used and some were used less frequently. From a choice of eight methods teaching practices, 'Observing in actual classrooms or working with individual students' and 'Planning and teaching in actual classrooms' were considered by early career teachers to be the most beneficial aspects of methods courses.

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Dedication

This book is dedicated to my friends and family, especially my parents, Gilbert and Libby; my mother-in-law, Neva; my dear husband Wade; our loving daughters, Stacy and Nikki; our son-in-law, Christian; and the cutest, smartest, sweetest grandchildren in the world, Elli and Zachary. Without your love and support, nothing else would matter. I am truly blessed.

CHAPTER 1 - Introduction

Preface

Imagine the absurdity: while dining out, most of the women and many of the men at the table glance at the menu and glibly announce: “Oh, I can’t read this. I’m awful at reading! I can’t even read my mail when it comes in.” It sounds too ridiculous to believe. And yet, especially as mathematics teacher educators, we routinely observe analogous situations when our tablemates glance at the bill: “Oh, I can’t figure this out. I’m awful at math. I can’t even balance my checkbook.” What seems outlandish in the realm of literacy is positively mundane when we’re talking about mathematics. Think about the dichotomy. Americans with low literacy skills go to extraordinary lengths to hide their struggles while math inabilities and phobias are worn like badges of honor. What a powerful testament to the tacit approval our society grants fashionable innumeracy. (Morris, 2006, p. 8)

Though fashionable innumeracy may trouble those of us in math education, many parents, administrators, and even other teachers seem unworried that the supposed lack of the “math gene” serves as justification for all types of life decisions. Parents use their own lack of math ability as an excuse for their children’s poor performance in coursework. High school and college students make lifetime career decisions based on the math degree requirements of certain professions (Darling-Hammond, 2003). Perhaps most upsetting, some math teachers and professors joke about their own lack of math ability. Others support education programs where lack or possession of supposed math capabilities determines who is held in courses year after year trying to memorize facts and algorithms and who is admitted into higher track courses, allowing them a myriad of opportunities not available to their lower track counterparts.

The National Council of Teachers of Mathematics has addressed this attitude toward math by espousing “math for all” and “all students can learn” throughout the

Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989) and the Principles and Standards for School Mathematics (NCTM, 2000).

The vision of equity in mathematics education challenges the pervasive societal belief in North America that only some students are capable of learning mathematics. This belief...leads to low expectations for too many students...Expectations must be raised—mathematics can and must be learned by all students. (NCTM, 2000, p. 12-13)

NCTM's vision clearly applies to all students, with the goal that adults can not only do mathematics, but have a positive attitude toward mathematics also. Does the preceding NCTM statement on equitable education for all students provide the proper prospective and motivation for educators in our country to address the complacency towards mathematics as demonstrated by our society? What further efforts can be initiated to address the NCTM goal of high expectations for all students and educators?

Introduction

The 1990s and 2000s have been a time of reform for mathematics in political arenas as well as professional ones. Possibly following trends set by previous presidents in attempting to “fix” broader problems by reforming schools (Tyack & Cuban, 1995) the No Child Left Behind Act (NCLB) was passed by Congress in 2001 and signed into law in 2002. One goal of the legislation was that all students demonstrate, via state developed assessments, their achievement of set math and reading standards. Schools must also show adequate yearly progress across all subgroups (NCLB, 2001). Though many have disagreed with the expectations and ultimate consequences of NCLB, the NCLB legislation has had a profound impact on how the educational community deals with students who struggle with mathematics. Schools have been forced to focus on those students who had previously been labeled as “slow” at math or struggling learners. Though some school districts have responded with more of the same “drill and kill” teaching strategies, other districts have focused on research-based practices for answers in addressing students’ needs.

Research supports the assertion that quality teachers have a significant impact on student learning. “It is now widely agreed that teachers are the most significant factor in

children's learning and the linchpins in educational reforms of all kinds" (Cochran-Smith & Zeichner, 2005, p. 1). The Principles and Standards for School Mathematics (PSSM) support the idea that effective, competent teachers are a key component in the quest for improvement in education. "Students learn mathematics through the experiences that teachers provide" (NCTM, 2000, p.16). Not only do these experiences affect students' understanding of mathematical concepts, but also students' dispositions toward mathematics and confidence in themselves as doers of mathematics (NCTM, 2000). The concept of *highly qualified* teachers, as outlined in NCLB (2001), has further supported the need for more research in the area of preparing competent, qualified teachers.

An additional impact of the NCLB legislation is the high expectations placed upon teachers to demonstrate success in the form of students' academic achievement. This expectation in conjunction with a lack of appropriate planning time, less than satisfactory working conditions, and sub-par wages (Cavanagh, 2008) produces a set of difficult obstacles for all teachers. These obstacles have had a far reaching impact upon teachers. One of the most significant has been the high rate of teachers, especially early career teachers, leaving the field.

Although national averages for attrition rates for all professions have remained steady at 11% for almost a decade, teacher attrition now averages 14.3% (Ingersoll, 2001), with math and science teachers averaging 16 percent. Novice teachers' attrition rates are even higher with about one-third of new teachers leaving the profession within the first three years (Feiman-Nemser, 2001). As reported by the Kansas Department of Education (2008a), attrition rates for Kansas mirror this rate with 30% of beginning teachers leaving the profession in the first two years of teaching. Darling-Hammond (2003) reported that since the early 1990s, the number of teachers leaving the field has surpassed the number of individuals beginning their careers as teachers, making the pressure to keep qualified teachers in our classrooms even more intense. Of special significance to this study is the fact that issues with teacher retention and attrition rates are higher in novice teachers who feel that they were less well prepared in their undergraduate education programs (Darling-Hammond).

Unlike new hires in other professions, novice teachers are (historically and currently) placed in positions with the same responsibilities as their veteran counterparts

(Feiman-Nemser, 2001; Lortie, 1975; Veenman, 1984). They are alone in their classrooms, facing decisions and situations, many for which they may not be and/or feel prepared (NCTM, 2007). Often novice teachers are reluctant or embarrassed to admit that they have problems and ask for help (Feiman-Nemser). Some school districts are responding to novice teachers' needs with mentoring programs, instructional coaches, and/or grade-level team meetings (Allen & Hancock, 2008). Even though many novice teachers report positive response to these interventions, others comment that these mentors and coaches are traditional practitioners, not knowledgeable in more current mathematics teaching practices (Allen & Hancock).

LaBerge and Sons (1999, p. 145) reported content area methods training was the “factor mentioned most often as contributing to their [novice teachers’] successful implementation of the Standards.” If sufficient support is not received from fellow veteran teachers, mentors, evaluators, and/or parents, many novice teachers may have only the strength of their university program teachings to sustain their beliefs, and therefore the practice of standards-based pedagogy.

Abundant research supports the positive impact of mathematics methods courses on beliefs, mathematical understanding, and pedagogical practices of novice teachers (Judson & Sawada, 2001; LaBerge & Sons, 1999; Robinson & Atkins, 2002; Valli, Rath, & Rennert-Aviev, 2001). Conversely, abundant research also questions the benefits of methods programs in these same areas (Bramald, Hardman & Leat, 1995; Foss & Kleinsasser, 1996; Frykholm, 1996; Raymond, 1997). However, no one questions the need for strengthening and improving our current preservice teacher preparation practices.

The NCTM Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989), the Professional Standards for Teaching Mathematics (NCTM, 1991) and the Principles and Standards for School Mathematics (NCTM, 2000) each expound on the value of strong teacher education programs while expressing reservations about existing preparation programs. “Collectively, these documents suggest current practices in teacher education will not produce teachers able to teach mathematics in the manner envisioned by the [mathematics education] community.” (Brown & Borko, 1992, p. 209)

Adding to the argument for change in current teacher education programs is the research reporting that early career teachers often fail to use the ideals set forth in their standards-based methods courses. In such courses, the subject matter taught is consistent with the NCTM content standards and the pedagogy aligns with the NCTM process standards of problem solving, reasoning and proof, communication, connections and representation. Instead of applying these standards-based teaching strategies, early career teachers often revert back to strategies with which they were taught during their K-12 education (Hart, 2001; Powell, 1992; Raymond, 1993). Researchers justify this reversal with many theories ranging from Lortie's (1975) ideas about the impact of the "apprenticeship of observation" to widely accepted ideas that novice teachers are *socialized* back to traditional views by veteran teachers and evaluators (Roberts, 2006) to Zeichner and Tabachnick's (1981) suggestion that, during college, preservice teachers do not actually become as liberal in their ideas as many think, therefore negating the theory that a reversal of beliefs ever even occurs. Though there is this wide range of theories on why novice teachers so often regress to traditional pedagogy, nearly all agree that we are asking something very difficult of preservice and novice teachers – to change their beliefs in how mathematics should be taught based upon a single semester of experience in a standards-based methods course.

Statement of Problem

The pressure placed on schools of education to prepare novice teachers for the realities of the classroom is mounting. Most preservice teachers have been schooled in math classrooms based on traditional beliefs. Therefore mathematics methods professors find they must concurrently address not only standards-based pedagogy, but also preservice teachers' common lack of profound understanding of the mathematics they will teach and long held beliefs about how mathematics should be taught. In addition, to be truly effective, methods professors must also prepare students for the socialization processes that novice teachers face as they enter the often very *traditional* world established by their veteran colleagues, uninformed evaluators, and parents and students who see "fashionable innumeracy" as acceptable. Dealing with sometimes acute needs in content knowledge, introducing standards-based teaching strategies, and addressing

deeply rooted attitudes towards mathematics in the short time frame usually allotted a methods course poses major problems in preservice teacher programs.

Research Questions

In an attempt to improve elementary mathematics methods courses and to support early career teachers in maintaining standards-based practices learned in these same methods courses this research focused on three questions:

1. What standards-based practices do early career elementary teachers report using in the teaching of mathematics?
2. What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?
3. What changes in their elementary mathematics methods course(s) do early career teachers feel would better prepare them to use standards-based practices in their classrooms?

Overview of Study (Theoretical Framework and Research Design)

This survey research study was viewed through the theoretical lens of symbolic interactionism. Though the concepts of symbolic interactionism were originally developed by George Herbert Mead while he was a professor of philosophy at the University of Chicago, the term was coined by one of his students, Herbert Blumer. Following Mead's death, Blumer and other of Mead's students compiled Mead's notes and, based on these ideas, Blumer published *Mind, Self, and Society* in 1937. In it, he used the term symbolic interactionism (Blumer, 1969, p.1). Though Blumer gives credit to Mead for "laying the foundations of the symbolic interactionist approach" (Blumer) and to Dewey, Thomas, Park, and others for "contributing to its intellectual foundation" (Blumer) he felt the need to develop his own version of this sociological theory.

Blumer described symbolic interactionism in terms of interaction between human beings. He found that human beings are unique in that when they interact with each other they do not just simply react, but actually interpret the other's actions, based on their own personal feelings toward that action. Blumer based his ideas on three premises. First,

“Human beings act toward things on the basis of the *meanings* those things have for them” (Blumer, 1969, p. 51). Though individuals’ meanings for things will vary, it is the right of the person to have these varied interpretations. The second premise is that meaning arises “in the process of interaction between people” (Blumer). One develops his/her meaning of something by observing how others “act toward the person with regard to the thing” (Blumer, p. 4). He used the term *language* to refer to this assigning of meaning through social interaction. The third premise was based on *thought* that represents the idea that each person defines meaning through personal interpretation. Each person has inner conversations, sometimes referred to as minding, and continually revises personal meanings based on new experiences and interactions.

Blumer also explained symbolic interactionism in another way – in terms of an example/counter example. He stated that non-symbolic interactionism might refer to the action of another without interpreting the action, a reflex for example. Blumer describes a boxer who reflexively raises his arm to block a blow as an example of non-symbolic interactionism. However, if that same boxer raises his arm based on his impression of a “feint designed to trap him,” he would be exemplifying symbolic interactionism (Blumer, 1969, p. 8). An educational example/counter example might be of a student who (nearly) reflexively copies a professor’s definition for standards-based pedagogy into his/her notebook and, a week later, writes that same definition on an exam. In reference to this study, this would constitute non-symbolic interactionism and would, very likely, result in no change in the beliefs of the student and the *non-use* of standards-based practices in the student’s future classroom. In contrast, a professor’s methodology reflecting the impact of symbolic interactionism on a characterization of standards-based practices would include group discussion, question opportunities, and multiple representations of the concept. The goal would be to minimize the impact of the students’ varied beliefs and ideas on the definition and allow for a final definition agreed on by the group. The hope would be that, by achieving closely “shared meanings,” preservice teachers would be more likely to believe in, and therefore use, standards-based practices in their own classrooms.

This viewpoint leads to concerns when discussing effective methods for the teaching of mathematics to preservice teachers. As a class of preservice teachers listens to

a methods professor explain current thinking in mathematics teaching, each student is interpreting this information based on his or her own attitudes and beliefs. Blumer stated that, in the framework of symbolic interactionism, objects have one meaning for one person, but another meaning for another person. Only when the object “has the same meaning for both, [do] the two parties understand each other” (Blumer, 1969, p. 9). Blumer provides the example of a tree having varied meanings in the minds of “a botanist, a lumberman, a poet, and a home gardener” (Blumer, p.11). Based on the theory of symbolic interactionism, traditional university teaching practices of lecture and note takings are not sufficient to address the varied meanings that students assign to the concept of standards-based practices.

Furthermore, as these students become teachers and attempt to utilize strategies learned in a methods course, each is doing so based on his or her interpretations of those strategies. When these circumstances are considered, many questions arise. Does classroom discourse allow for development of shared meaning? Are the beliefs that drive individual interpretations being addressed? How can elementary mathematics methods instructors determine the impact that their courses have on novices’ teaching practices and therefore attempt to improve those courses and practices?

In order to gather information to aid in answering these questions, a survey was emailed to over 1000 early career elementary teachers in the state of Kansas using the Axio Survey tool available through Kansas State University. A Kansas State Department of Education database was used to gain Email addresses of math contact persons in some of the 297 districts in Kansas. Other contacts were determined using the 2008-2009 Kansas Educational Directory. The researcher had analyzed results of a previous survey, *The Young and the Rest of Us*, developed by faculty members of the Kansas State University Education Department. Based on ideas gained from this work, the focus of the current survey was on the use of standards-based practices by early career teachers and how the teachers feel that methods courses facilitated or hindered those practices.

This data-gathering method aligned with the theoretical framework of symbolic interactionism. Blumer contended that if a scholar (in this case the researcher) wanted to understand the actions of others he must “see their objects as they see them.” “Research scholars, like human beings in general” (Blumer, 1969, p.51-52) tend to assume that

others view things as they do and, in so doing, may fail to report findings accurately. The survey research employed for this study allowed early career teachers to speak for themselves, perhaps allowing for a clearer perspective on the research questions.

Survey questions were divided into five sections with the first and last covering demographic information, and the second through fourth dealing with each of the three research questions: (1) standards-based practices that the teacher feels he/she uses in his/her classroom, (2) ways in which his/her methods course aided his/her use of standards-based practices in the classroom, and (3) suggestions for changes in methods courses that would better support the use of standards-based practices. Both open and closed questions were included allowing for the results to be evaluated using both qualitative and quantitative methods of research.

Significance of Study

The significance of this survey study was multi-faceted. First, there is little data on the impact of methods courses on novice teachers' practices and on what colleges and universities can do to help novice teachers maintain standards-based practices. Though there are numerous research studies on the impact of methods courses on preservice teachers' standards-based beliefs and practices, there is much less data concerning the impact on novice teachers (Clift & Brady, 2005). The 2005 Report of the American Educational Research Association Panel on Research and Teacher Education stated many studies relate to teacher candidate beliefs and attitudes, but "we need research that examines the impact of coursework and fieldwork on other outcomes, such as teachers' practices and knowledge growth" (Cochran-Smith & Zeichner, 2005). This survey gave teachers the added opportunity to report what standards-based practices they used in their classrooms.

The survey method supported other needs in the field of teacher education research. Deborah Ball stated that researchers need to spend more time listening to teachers (Ball, 2003). Zeichner & Gore (1990) asserted that teacher education research has often been "research on rather than for the people who are studied (teachers, students, teacher educators)." Therefore, "there is need to develop new and more interactive methods of conducting research that illuminate teachers' perspectives of their own

development” (pp. 342-343). Survey questions provided this opportunity. The questions allowed novice teachers the opportunity to speak for themselves and to answer with anonymity, therefore encouraging honesty in the responses.

Because this research’s focus was on listening to teachers, there were opportunities for additional benefits. First, the mathematics community needs to better understand why novice teachers routinely return to teaching pedagogy based on how they were taught in their K-12 programs instead of incorporating standards-based pedagogy discussed in their methods courses. As math educators we must also consider how to best prepare our preservice teachers to enter school cultures where veteran teachers or administrators may not agree with their teaching and learning philosophies (Hart, 2001). By allowing teachers to state both benefits and suggestions for methods courses, mathematics methods instructors should be able to gain ideas in this area. Second, the AERA call for research included that which can aid in recruitment, preparation, and retention of teachers (Cicmanec, 2006). With the high attrition rates of teachers, gaining information about ways to strengthen their preparation programs could be used to aid new teachers as they face the challenges associated with the early years of teaching.

Limitations of the Study

The limitations of this study, as well as studies of others researching mathematics education, are well described by Roberts (2006) paraphrasing ideas of Simon (2000). He stated there exists:

... an interesting dilemma in mathematics teacher education. First, reform ideas of the teaching and learning of mathematics is different than what many teachers have experienced in traditional mathematics classrooms. Second, research on teacher development generates accounts of what is in place at the present. So, it is difficult to research and understand a phenomenon that is not in practice at the present. The ideas underlying reform-based mathematics require not only a new vision of mathematics classrooms, but also a new vision of mathematics teaching. Since we do not have a deep understanding of how beginning teachers develop reform based instructional techniques and there are not sufficient examples in

place to learn from, we are in a situation of trying to understand a process that is currently largely unrealized. (p. 29)

The theoretical framework of symbolic interactionism played an important role as the researcher considered the contexts under which all participants view standards-based mathematics. In evaluating the survey data collected, the researcher was cognizant of the misconceptions associated with the concept of standards-based mathematics. As is often the case with reform, misinformation and misunderstandings often lead to lack of discernment of the actual ideas. By acknowledging this situation, the researcher was especially mindful of including clear instructions and survey questions and provided the opportunity for respondents to request explanations of questions that they did not understand and/or provided additional explanation if desired.

Self-reporting data is a limitation of survey data gathering methodology. The first two questions of the survey requested information on years taught and if the respondent was currently teaching mathematics. The researcher assumed that these two questions were answered honestly by respondents and that only those teachers who chose the category of 1-3 years of teaching and answered yes, that they were currently teaching mathematics, completed the survey. Though the sample responding to the survey had the two afore-mentioned characteristics in common, the researcher understood that the respondents were very likely to be quite unique in all other characteristics. They attended various universities and were of varied ages, ethnicities, and genders. They were traditional and non-traditional students with various education-related experiences. All entered and exited their methods course with uniquely different beliefs about math education. This varied sample was perceived as a strength as it provided a truer representation of the feelings of a broad spectrum of Kansas early career elementary teachers.

In attempting to address the issue of non-response or low response, a gatekeeper for each district in Kansas was first determined. This person was contacted by phone or email and a detailed explanation of the survey and its purpose was provided. Multiple contacts were required in many districts before an administrator's permission to send the survey was granted. In some cases, this permission was only approved after agreeing to

send an early copy of the survey or after an application to do research was completed. A letter of introduction preceded the survey. This letter explained that their name and email address had been gained through a contact person in their district. The letter and the directions for the survey stressed the reasons for and importance of the survey and offered a copy of the compiled results. The fact that responses were anonymous and that the survey would only require a short period of time were stressed. Those receiving the survey could choose to not complete it, but follow up reminders were sent to non-respondents. Knowing that bias can occur when a sample does not truly represent a population, every effort was made to encourage response from teachers from all types of educational settings – small and large, rural and urban, representing all geographical regions of the state of Kansas, and teachers from all grade levels K-6.

Definition of Terms

Constructivism – often defined as a theory of learning, as an epistemology and as a descriptive term for certain teaching practices. In a classroom it is characterized by hands-on, minds-on manipulation as groups work to understand content; students engaging in inquiry; and students are allowed to struggle and develop their own theories (Dias, 2000). Deep, conceptual understanding and a focus on the big ideas of mathematics are at the heart of each lesson (Goldsmith & Mark, 1999).

Content knowledge – Shulman (1986) suggests 3 categories of content knowledge – subject matter content knowledge, pedagogical content knowledge, and curricular knowledge

Curricular content knowledge – “instructional materials available to teach content and why some materials are better than others” (Shulman, 1986, p. 10)

Early career/novice/beginning teacher – Teachers who have taught 3 or fewer years (Veenman, 1984)

Manipulatives – “...objects which represent mathematical ideas that can be abstracted through physical involvement with the objects. The materials are sometimes referred to as concrete materials, physical objects, or concrete objects.” (Krug, 1988, p.8)

No Child Left Behind (NCLB) – An Act of Congress also known as PL 107-110, the No Child Left Behind Act of 2001. The Four Pillars of NCLB are “stronger accountability

for results, more freedom for states and communities, proven education methods, and more choices for parents.” (No Child Left Behind Act of 2001)

Pedagogical content knowledge - knowledge of subject matter for teaching – good representations of it, examples, “the ways of representing and formulating the subject that make it comprehensible to others,” an understanding of what makes it easy or difficult for others (Shulman, 1986, p. 9)

Process standards – Described as “ways of acquiring and using content knowledge” (NCTM, 2000, p. 29) these are standards #6-10 of the ten standards presented in Principles and Standards for School Mathematics.

Problem solving – “engaging in a task for which the solution method is not known in advance” (NCTM, 2000, p. 52)

Reasoning and proof – “developing ideas, exploring phenomena, justifying results, and using mathematical conjectures in all content areas” (NCTM, 2000, p. 56)

Communication – using “speaking, writing, reading, and listening” to organize and analyze mathematical thinking and “using the language of mathematics to express mathematical ideas precisely.” (NCTM, 2000, p. 60)

Connections – recognizing and understanding connections among mathematical ideas and in mathematics “as a coherent whole” and “in contexts outside of mathematics” (NCTM, 2000, p. 64)

Representation – “the act of capturing a mathematical concept or relationship in some form and [to] the form itself” (NCTM, 2000, p. 67)

Standards or NCTM Standards – One term that is used to describe four NCTM documents: “The Curriculum and Evaluation Standards for School Mathematics” (1989), the “Professional Standards for Teaching Mathematics” (1991), the “Assessment Standards for School Mathematics” (1995), and the “Principles and Standards of School Mathematics” (2000). (Goldsmith & Mark, 1999)

Standards-based practices, standards-based instruction, standards-based teaching, reform-based practices, reform-based instruction, reform-based teaching –The focus in the classroom is on a constructivist educational perspective, “helping students develop deep conceptual understanding relating to the major strands of mathematics,” and

development of the five mathematical processes of problem solving, reasoning and proof, communication, connections, and representation. (Goldsmith & Mark, 1999, p. 41).

Because ‘reform-based’ is often used to designate ‘standards-based’ in mathematics education research, the terms will be used interchangeably in this document.

Subject matter content knowledge - not just knowledge of “facts and content, but understanding the structures of the subject matter,” why it is worth knowing, why the content is true, why it is central to the discipline (Shulman, 1986, p. 9)

Symbolic interactionism – a social science perspective (and a theoretical framework for this study) based on three premises: (1) “human beings act toward things on the basis of the meanings that the things have for them” (2) “the meaning of such things is derived from, or arises out of, the social interaction that one has with one’s fellows” (3) these meanings are handled in, and modified through, an interpretive process used by the person in dealing with things he encounters” (Blumer, 1969, p. 2).

Teacher socialization - “field of scholarship that seeks to understand the process whereby the individual becomes a participating member of the society of teachers.” (Zeichner & Gore, 1990, p.329).

Traditional pedagogical practices – teacher lecturing or explaining to the entire class and then assigning “seatwork” for students to complete individually at their desks. (Sirotnik, 1983); “focuses on memorization, rote learning, and application of facts and procedures” “w/direct instruction, drill, and practice.” (Goldsmith & Mark, 1999, p. 40)

Veteran teachers – Teachers who have taught 4 or more years.

Summary

We have no choice but to provide our preservice teachers with university courses of the highest quality. If, in our methods courses, we do not adequately address necessary content knowledge and pedagogy in a manner that not only explains, but also models, standards-based mathematics teaching, research tells us that novice teachers will do one of two things. They will either conform to the traditional methods of their youth and of many of their veteran teacher counterparts or they will leave the ranks of teaching before they have the experience and the confidence to attempt reform methodology (Freiberg, 2002).

Given that neither of these outcomes is acceptable, solutions must be sought.

Little research on teachers' opinions of their mathematics methods courses is available, especially research based on teachers' opinions after they have had the opportunity to "test" the ideas in their own classrooms. This research offered early career teachers an opportunity to share those opinions. Because of the anonymous format of the survey and nature of the questions, the data gathered can be used to begin to develop a description of the strengths and the weaknesses of elementary mathematics methods courses as seen through the experiences of early career teachers. The open ended questions provided support for those areas designated as stronger and suggestions for those areas deemed weaker.

CHAPTER 2 - Review of Literature

Introduction

Following a brief prelude on the history of standards-based mathematics, this literature review will be grounded in research in three distinct areas – teachers, early career teachers, and university elementary mathematics methods courses. These three topics will be discussed separately then their intersection will lay the groundwork for this current research project. In order to improve elementary mathematics methods courses and to support early career teachers in maintaining standards-based practices learned in these same methods courses these research questions will be addressed:

1. What standards-based practices do early career elementary teachers report using in the teaching of mathematics?
2. What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?
3. What changes in their elementary mathematics methods course(s) do early career teachers feel would better prepare them to use standards-based practices in their classrooms?

In the first segment, the impact of teachers on student learning, the pressures on teachers, and disturbing attrition rates among teachers, especially early career teachers, will be discussed. The second portion on early career teachers will address multiple topics. The challenges faced by early career teachers will be reviewed followed by a review of the stages through which new teachers are professed to pass. The impact of socialization will then be examined in the three categories proposed by Zeichner and Gore (1990) - experiences prior to college, during college and as an inservice teacher. In concluding the research on early career teachers, their use of traditional versus reform-based teaching will be reviewed. It will be noted that a high percentage of early career teachers never apply the standards-based practices learned in mathematics methods courses to their teaching and/or revert back to traditional teaching strategies within their early years of teaching (Flores, 2001; Hart, 2001; Raymond, 1997).

With this concern and others, NCTM and researchers on all sides of the methods debate have issued a call for improvement in U.S. teacher preparation programs (Flores, 2001; Gold, 1996; Gregg, 1992; LaBerge & Sons, 1999). In line with this research, the impact of elementary mathematics methods courses will be reviewed. Research both supports and denies the positive influence of mathematics methods courses on teacher quality, beliefs and practices (Darling-Hammond, 2003; LaBerge & Sons; Zeichner & Gore, 1990). These opposing views will be discussed. Feiman-Nemser's (2001) Central Tasks of Preservice Preparation will be presented as a possible basis on which to develop methods courses. These five tasks address subject matter knowledge, understanding learners, pedagogy (including reform-based teaching), beliefs, and developing the habits of a life long learner.

In the short time frame of a methods course, elementary mathematics methods instructors attempt to address numerous issues. While attempting to teach standards-based pedagogy and associated curricular knowledge, professors are simultaneously faced with students who historically lack adequate content knowledge (Ball, 1990b; Hart, 2001; Ma, 1999) and whose belief systems cause them to question all they are hearing (Lortie, 1975; Richardson, 1996). These challenges lay the groundwork for the need for this study.

Historical Perspective on Standards-based Teaching

The history of mathematics is a tale of debate and cycles of reform: psychology vs. math, basics vs. problem-centered, child centered vs. subject centered, mathematicians vs. mathematics educators, traditional vs. reform. The cycle can be seen through the history of mathematics and mathematics education. One can find the same conflicts and tension in today's writings. One conflict has concerned teachers' preparation and whether it should focus on content or pedagogy. Shulman (1986) provided a glimpse into teacher preparation in the late 1800s based on teacher diary excerpts and elementary school teacher exams from the time period. As indicated by both, nearly all teacher preparation at the time was content oriented. Pedagogy was basically ignored. Though many supported this content-based approach as adequate teacher preparation, there were others

such as John Dewey who were proposing the idea of including pedagogy preparation.

Though some charged Dewey with focusing solely on pedagogical preparation, his writings indicated otherwise. He regularly related examples of how lack of teacher subject area knowledge impaired student learning (Dewey, 1876-1883). Dewey felt that teacher subject matter knowledge allowed teachers to concentrate on student thinking and anticipate problems (Dewey, 1881-1891). During the early 1900s the psychology of teaching math gained prominence, with William Kilpatrick being influential in the reform ideas of Progressive Math. The idea of math as a mental discipline lost support as the idea of teaching only practical math gained support. Math educators indicated support of these progressive ideas by establishing the National Council of Teachers of Mathematics in 1920 (Kilpatrick, 2006).

Another notable figure in educational research, W. A. Brownell, addressed teacher preparation. Noting that teachers needed knowledge of both learning and subject matter (Brownell, 1945), he promoted “learning theory,” becoming an early advocate for the idea of teaching for meaning. In some ways, his work precipitated the modern math movement of the 1950s and 60s where understanding the concepts, connections and theories of mathematics again became important. The close of World War II and the successful launch of Russia’s Sputnik in 1957 further spurred interest in mathematics education reform. The progressive movement, which had focused on teaching the practical aspects of math, faded as modern math gained prominence.

The 1950s and 60s introduced us to Piaget, whose ideas on child developmental stages still influence mathematics teaching today, and George Polya, whose problem solving model still graces many a classroom wall. The modern math era challenged teachers whose math content knowledge did not provide the basis needed to teach mathematical ideas that they did not truly understand. Students struggled and parents reacted negatively in response. Partially in reaction to modern math, the pendulum of reform brought in the “back to the basics” or “competency based movement” in math education for the 70s.

As has been noted, educational reform had been ongoing. However, the current era of standards-based mathematics could be said to have begun with the publication of *A Nation at Risk* in 1983 (Draper, 2002). Another document, *Agenda for Action*, had been

published in 1980 and was later codified to become NCTM's 1989 *Curriculum and Evaluation Standards*. These documents called for new directions in math education with a focus on problem solving, diverse teaching strategies, a more demanding curriculum, rigorous standards and better teacher preparation. In 1991, NCTM published the *Professional Standards for Teaching Mathematics*, followed by the *Assessment Standards for School Mathematics* in 1995. The *Assessment Standards* stressed the importance of the integration on assessment and instruction, further defining the changing perspectives of teaching.

Each of these documents called for reform in mathematics education. Terminology varied, but the terms reform-based practices, standards-based practices, reform-based teaching and standards-based pedagogy all became synonymous with teaching strategies such as the use of manipulatives, cooperative work on projects, and learning by doing (NCTM, 1989). Other documents, *Everybody Counts: A Report to the Nation on the Future of Mathematics* (National Research Council, 1989) and *A Call for Change: Recommendations for the Mathematical Preparation of Teachers of Mathematics* (Leitzel, 1991) reiterated the call for reforms in the way we prepared teachers to teach mathematics.

These documents, in particular *Agenda for Action* (NCTM, 1980), the *Curriculum and Evaluation Standards* (NCTM, 1989), and the *Professional Standards for Teaching Mathematics* (NCTM, 1991) called for teachers to teach in ways that differed radically from their experiences as students and from the ways that they were prepared to teach (Manouchehri, 1996). *Before It's Too Late: A Report to the Nation on Math and Science Teaching* (National Commission on Mathematics and Science Teaching for the 21st Century, 2000) further stressed the need for teacher education programs. Though NCTM's 2000 *Principles and Standards of School Mathematics* did not specifically call for teachers to teach in a constructivist manner, it did call for pedagogical strategies that parallel constructivist perspectives (Draper, 2002).

Constructivism continues to be defined in many ways, as a theory of learning, as an epistemology and as a descriptive term for certain teaching practices. However it is defined, one might see these practices in a constructivist's classroom: hands-on, minds-on manipulation as groups work to understand content; students engaging in inquiry; and

students being allowed to struggle and develop their own theories (Dias, 2000). Students could be observed actively learning - discussing, writing, reasoning, and problem solving. Deep, conceptual understanding and a focus on the big ideas of mathematics are at the heart of each lesson (Goldsmith & Mark, 1999).

These constructivist practices also demonstrate reform-based or standards-based teaching. Goldsmith and Mark (1999), in defining standards-based mathematics curriculum, referenced NCTM's five process standards as the focus in a classroom with a constructivist perspective. NCTM highlights five processes that all students should be able to use as they do mathematics: communication, connections, reasoning and proof, representation, and problem solving. In the survey that supports this current research the process standards were used as the organizational tool for Section 2 where respondents identified the standards-based practices that they use in their classrooms. The following table indicates the definition and/or description provided for each process standard on the survey.

Table 2.1 Process Standards

NCTM Process Standards	Survey Questions	Description of standard used on survey
Communication standard	#3 & #8	NCTM states that students should “communicate to learn math” and “communicate mathematically.”
Connections standard	#4 & #8	NCTM states that students should see the connectedness among mathematical topics and how mathematics relates to other subjects and to their own lives and experiences.
Reasoning standard	#5 & #8	According to NCTM, reasoning involves “developing ideas, exploring phenomena, and justifying results.”
Representation standard	#6 & #8	Representations can include, among other things, drawings, manipulatives, graphs, equations, charts, numerals, spread sheets, etc.
Problem solving standard	#7 & #8	NCTM defines problem solving as “engaging in a task for which the solution method is not known in advance.”

In contrast to a constructivist or standards-based or reform-based classroom a traditional classroom follows practices that O’Brien (1999) called “parrot math.” In a “parrot math” classroom, arithmetic, rather than mathematics, is the focus. Content “is taught by force-feeding of inert facts and procedures shorn of any real-life connections” (O’Brien, p. 434). O’Brien related that, even in the 1930s, William Brownell criticized “parrot math” saying it should be replaced with strategies leading to the development of understanding and meaning.

According to *Before It’s Too Late* (National Commission on Mathematics and Science Teaching for the 21st Century, 2000) and Draper (2002), traditional math classrooms tend to share many similarities. Common to most descriptions of a traditional math lesson are a review of homework, teacher presentation on new material, drill on procedures following the model presented by the teacher (sometimes called seatwork), and a homework assignment. Other common practices include rote learning, memorization, and a focus on procedures (Goldsmith & Mark, 1999). These traditional

classrooms are still the norm today even though the standards-based movement began nearly 20 years ago. Its staying power is a testimony to the power of socialization and tradition.

Current documents continue to call for classroom pedagogy that reflects reform or standards-based ideology. *Adding It Up – Helping Children Learn Math* (National Research Council, 2001) combines knowledge of learning with current research to suggest changes in teaching methods, curricula and teacher education. Mathematical proficiency is defined with a model of five intertwined strands. The five strands represent conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition. (National Research Council, 2001, p. 116).

The Mathematical Education of Teachers (American Mathematical Society) also published in 2001, represents the findings of a number of mathematics organizations. The focus of the books was to support a common vision for the preparation of mathematics teachers. The committee made 11 recommendations. Among these were: 1. Universities need special courses just for teachers. 2. Mathematics departments should give value to the teacher preparation courses. 3. There needs to be more cooperation between the mathematics and the education department faculty. 4. The focus of the coursework needs to be on deep understanding of the mathematics that will be taught.

The most current standards document from NCTM, *Curriculum Focal Points* (2006), calls for a curriculum that focuses on fewer topics, but teaches them in more depth. NCTM suggested that a few broad categories of important mathematics be the focus at each grade level. Though some states have chosen to center their state standards around the focal points, it is yet to be determined if they will have the impact desired by many in the math education community.

As teachers are being asked to change the way that they teach, many are realizing that past assumptions are not valid. It was assumed that elementary teachers learned all of the mathematics that they needed during their own K-12 schooling. However, this has been found to not be the case. “There is evidence of a vicious cycle in which too many prospective teachers enter college with insufficient understanding of the mathematics they will teach, have little college instruction focused on the mathematics they will teach, and then enter their classrooms inadequately prepared to teach” (American Mathematical

Society, 2001, p. 5)

And so the cycle continues. Stronger teacher education programs produce better teachers. Better teachers enhance student achievement. Higher achieving students have better attitudes toward mathematics and, perhaps, become teachers themselves. Through the years, various reform movements have seemed to succeed only to be replaced by the next well-intentioned idea. The standards movement has now survived since the 1980s. With the publishing of the *Curriculum Focal Points* some would say that this reform movement continues to survive. The question to be answered is if it will not only continue to survive, but finally begin to thrive.

Teachers

Impact on Student Learning

The role that teachers play in student learning has been widely researched (Cochran-Smith & Zeichner, 2005; Darling-Hammond, 2003; Feiman-Nemser, 2001). Darling-Hammond (p. 7) reports that “substantial research evidence” exists supporting the positive impact of “well-prepared, capable teachers” on student learning. Feiman-Nemser concurs that quality schools are dependent on quality teachers. It is accepted that how teachers teach directly impacts what students learn. Cochran-Smith and Zeichner (p. 1) are often quoted that “It is now widely agreed that teachers are the most significant factor in children’s learning and the linchpins in educational reforms of all kinds.” Reform directly associated with mathematics is no exception when considering teacher impact.

Many factors are crucial to the success of a reform or standards-based mathematics program in schools. Bay, Reys, and Reys (1999) suggested ten elements needed in order to implement standards-based curricula. Standards-based curricula are generally defined as teaching materials that are aligned with the NCTM standards. Specifically, the NCTM Process Standards of problem solving, reasoning, connections, communication and representation are stressed. Among their ten elements Bay, Reys and Reys proposed that administrative support, time, communication with parents, and interaction with experts were critical components of a successful program. Noteworthy in their list, however, was the number of times that the teacher was mentioned – teachers

planning, teachers helping students adjust, teachers assessing differently. The role of the teacher obviously plays a key role in a successful standards-based mathematics program.

The National Mathematics Advisory Panel (2008) drew multiple conclusions concerning teachers' impact on student learning in mathematics. The panel addressed a teacher's role in providing both an opportunity for students to learn and to mathematics learning itself. The panel reported that a total variability of 12 percent to 14 percent in student achievement gains in a single elementary school year could be attributed to differences in teachers (p. 35).

The National Council of Teachers of Mathematics (NCTM) concurs in their 2000 Principles and Standards for School Mathematics (PSSM). The Teaching Principle, one of six principles on which the standards are based, states, "Students learn mathematics through the experiences that teachers provide. Thus, students' understanding of mathematics, their ability to use it to solve problems, and their confidence, and disposition toward mathematics, are all shaped by the teaching they encounter in school." (pp.16-17). The question is no longer if teachers play a major role in student mathematics achievement, but how to support teachers in that role.

Pressures on Teachers

It is widely accepted that concern for student learning is only one of multiple pressures faced by teachers. Low salaries, lack of planning time, less than satisfactory working conditions (Cavanagh, 2008), and student issues lead to stressful working conditions. The high expectations of student achievement placed on teachers as a result of the NCLB legislation is an added pressure. Skip Fennell (2007, p. 3), past president of NCTM, states, "Large scale [high stakes] assessments haunt all teachers." All teachers are affected when, on top of getting the classroom in order, stocking materials, and participating in professional development, they [teachers] must be constantly aware of the expectations of NCLB legislation. The pressures go beyond that of just student progress, but also to the impact of that progress on one's school and school district. These pressures on teachers have had other far reaching impacts. One of the most significant impacts has been the high rate of teachers, especially early career teachers, leaving the field.

Attrition Issues

As pressures on teachers escalate, concerns about high teacher attrition rates also increase. Darling-Hammond (2003) viewed teacher attrition as a multifaceted issue, far beyond the need to just recruit more to the teaching profession. Darling-Hammond reported that we actually train more teachers than we hire, but we do not keep the teachers that we train. Our school systems have faced a critical problem since the early 1990s as teachers exiting the field have surpassed those entering the field in increasing numbers.

NCLB has impacted teacher attrition in ways other than added pressure on teachers. According to Darling-Hammond (2003, p. 7), “The NCLB Act requirement that schools staff all classrooms with ‘highly qualified teachers’ creates a major challenge, especially for schools in inner-city and poor rural areas.” Staffing our schools with qualified teachers becomes even more difficult, of course, when large numbers of teachers choose to leave the field.

The 2005 AERA Panel report on teacher education (Cochran-Smith & Zeichner, 2005) estimated an overall teacher attrition range from 5% to 9% annually. It was commonly perceived that retiring teachers accounted for a large part of this percentage. However, Darling-Hammond reports that less than 20% of annual attrition was actually due to retirement (Henke, Chen, Geis, 2000; Ingersoll, 2001). Though statistics vary slightly, research supports that early career teachers actually account for a large portion of annual attrition rates. The National Council of Teachers of Mathematics Position Statement on Mentoring New Teachers (2007) stated “nearly half of new teachers in the United States leave the profession in their first five years of teaching” and “attrition rates [] are around 30% for teachers in first three years.” Bobbitt, Leich, Whitener and Lynch (1994) reported a rate of 9.3% of teachers in their first year. Darling-Hammond stated that about one-third of early career teachers leave the profession within the first five years. Gilles, Cramer and Hwang (2001) reported that at least 18% of new college graduates leave the profession within three years.

According to Hancock (2007), 39% of teachers in Kansas leave teaching within their first six years of teaching. Similarly, Kansas early career teachers, on whom this research focuses, have an attrition rate of up to 30% in their first two years of teaching

(KSDEa, 2008). The Kansas Department of Education addresses the issue of attrition on their website in *A Vision for Early Career Teacher Induction in Kansas* (2008a, p. 1). It states, “When examined in the context of declining rates of participation in teacher training and the large percentage of Kansas teachers who are within five to ten years of retirement, it becomes imperative that local school districts and the state of Kansas find ways to attract and retain new professionals.”

Research by Kain and Singleton (1996) supported the theory that teaching experience increases teacher effectiveness. Educational productivity is directly affected as schools use resources to train early career teachers only to have them leave after a few years of teaching (Carroll, Reichardt, & Guarino, 2000). Darling-Hammond (2003, p. 9) suggests that “Unless we develop policies to stem such attrition through better preparation, assignment, working conditions, and mentor support, we cannot meet the goal of ensuring that all students have qualified teachers.”

The National Council of Teachers of Mathematics has also recognized the issues involved with the new teacher exodus from the field. Results of surveys and specific requests from early career teachers led to seminars at the 2008 annual convention geared toward early career teachers’ specific needs (Cavanagh, 2008). An entire strand of sessions focused on new math content, managing classrooms and resource avenues. The goal was to provide positive support for early career teachers (Cavanagh).

Gold (1996) considers it essential that we determine why teachers spend four or more years preparing to be a teacher then leave so early. Though the consensus is that a solution to new teacher attrition must be found, there is disagreement as to why the attrition rate is so high. Zeichner (1980) suggested problems associated with “professional and social integration into teaching and the role of the administrator.” He also suggested the lack of opportunity for upward mobility, lack of parents’ interest and support, and discipline problems. Ingersoll (2001) associated other issues with high rates of turnover. Possible reasons included lack of administrative support, discipline issues, lack of input in school decision making, and to a lesser extent, low salaries.

Of special interest to this researcher was the research suggesting that the amount of education and the adequacy of the teacher preparation program affected early career teacher longevity (Gold, 1996). The theory that preparation may impact attrition rates

was supported by Darling-Hammond's 2003 research. Although other factors such as salary and working conditions played a role in teachers' choices to leave teaching, well prepared teachers tended to stay in the field longer. Zumalt and Craig (2005) noted that these attrition rates should provide teacher educators with information on which to base advising and program decisions. Insights into why teachers leave could offer methods professors a valid basis on which to better prepare them for the challenges they will face as novice teachers.

Early Career Teachers

Challenges and Expectations

According to Gold (1996, p. 548), "Few experiences in life have such a tremendous impact on the personal and professional life of a teacher as does the first year of teaching" (p. 548). Early career teachers are inducted into teaching with what is often referred to as the "sink or swim" approach (Feiman-Nemser, 2001; Lortie, 1975). Unlike novices to other professions, on the first day in the classroom, early career teachers have nearly the same responsibilities as their veteran counterparts. Instead of assuming responsibilities gradually, they are just as responsible for classroom management, student learning, and daily tasks as a veteran teacher (Feiman-Nemser; Lortie; Manuel, 2003). Lortie (pp. 59-60) described early career teachers as, "student in June and a fully responsible teacher in September."

Compounding this problem is the fact that early career teachers are often given more difficult groups or classes that veteran teachers do not want (Breeding & Whitworth, 1999). They are often placed in teaching positions outside their area of qualification (McCormack, Gore & Thomas, 2004) or are given too many classes. In their new positions they often lack classroom supplies and are not provided extra time for preparing lessons on material with which they are unfamiliar. High stakes testing is always an issue. (Cady et al., 2005b; Dias, 2000; Feiman-Nemser, 2001). These early career teachers have two concurrent jobs, "they have to teach and they have to learn to teach" (Feiman-Nemser, p. 1026)

Early career teachers are alone in their classrooms, facing decisions and situations for which they may not be and/or feel prepared (NCTM, 2007). Administrators are often

viewed as evaluators rather than mentors, leading early career teachers to attempt to work out problems on their own. Fearing that problems will lead to poor evaluations or that they will appear incapable, early career teachers are often unwilling to ask for help (Feiman-Nemser, 2001; McCormack, Gore & Thomas, 2004). This “sink or swim” induction encourages novices to stick to whatever practices enable them to survive whether or not they represent ‘best’ practice in that situation” (p. 73). As methods professors we must ask ourselves how we could better prepare them for these years of ‘trial by fire’.

Stages/phases of Development

Over the years, multiple researchers have named and described the stages or phases through which early career teachers pass. Nearly all are based on the 1969 work of Fuller who observed that most student teachers and beginning teachers undergo a similar progression of concerns in their early teaching experiences. Brown and Borko (1992) suggested that these stages were not necessarily experienced within designated years of teaching or at particular teacher ages. Other researchers agreed that years of teaching experience in each stage vary and, on this basis, Bullough and Baughman (1993) and Nimmo, Smith, Grove, Courtney, and Eland (1994) suggested caution when using stage theory. However, the scope of the research on this particular perception of early career teaching was so extensive that it deserved note.

Fuller (1969) conceptualized three developmental stages of concern through which early career teachers pass. The stages were Non-concern for students, Concern for Self with only covert concern for students, and Late Concern where concerns for the students actually emerged. Breeding and Whitworth (1999) noted that this classic study was replicated by Sitter and Lanier in 1982 and Rutherford and Hall in 1990. As had researchers before them, each pair of researchers noted variances in time required to pass through the stages.

Fuller and Bown (1975) further delineated Fuller’s work with stages designated as Self-Adequacy, Teaching Tasks and Teaching Impact. The Self-Adequacy Stage was often called the survival stage with new teachers being concerned with being accepted and respected by evaluators, students and other teachers. In the Teachings Tasks Stage

the teachers showed increasing concern for aspects of teaching such as workload, discipline, and inflexibility of the work environment. It is not until the Teaching Impact Stage that concerns turned toward student learning and well-being. Teachers now were able to focus on such problems as addressing unmotivated students, student absences or school climate.

Multiple researchers have renamed, added to, or otherwise altered Fuller and Bown's stages. Burden (1982) used the names Survival Stage, Adjustment Stage, and Mature Stage. Ryan (1986), on the basis of his study of early career science teachers, added a Fantasy Stage before teachers begin the Survival Stage. Berliner, in 1988, simply named his five stages novice, advanced beginner, competent, proficient and expert.

Moir (1999) broke with tradition and was very specific about time spans in a teacher's first year of teaching. Based on her work with 1500 beginning teachers in the Santa Cruz New Teacher Project she designated five time frames. At first the teacher remained idealistic in the Anticipation Phase. After the first few weeks, the teacher entered the Survival Phase in which she may have worked up to 70 hours a week and, though overwhelmed, maintained enthusiasm. A few months into teaching, however, the teacher's self esteem became lower and he/she questioned his/her commitment to teaching. Moir named this stage the Disillusionment Phase. The holiday break allowed new teachers to refocus and the Rejuvenation Phase began. Near the end of the first year, new teachers began the Reflection Phase where they were actually able to reflect on the past year and begin to plan for their second year of teaching.

Regardless of the researcher, the names of the stages, or the time frames assigned, research has shown us that new teachers struggle. New teachers are placed in teaching situations for which they may not fully prepared. Lacking the confidence to ask for help, early career teachers often remain in Fuller's Non-concern for Students Stage or Fuller and Brown's Self-Adequacy Stage or Burden's Survival stage. As such, simply surviving the day, instead of student learning, remains the focus. Often, too, the focus on standards-based teaching practices was put aside in lieu of the more comfortable pedagogical practices experienced in the teacher's K-12 years as a student (Lortie, 1975).

Teacher Socialization

When considering factors that influence an early career teacher's ability and belief in implementing reform-based instruction, research related to teacher socialization must be considered. Research by Lortie and later by Zeichner and Gore and Zeichner and Tabachnick formed the groundwork on which other teacher socialization researchers built. Zeichner and Gore (1990, p. 329) defined teacher socialization as "the process whereby the individual becomes a participating member of the society of teachers." The term can be applied to three periods in a beginning teacher's mathematics education. First, there were the years before formal teacher education when the teacher, as a k-12 student, observed his or her teachers' classroom practices. Second, the term was applied to the university years. Last, teacher socialization occurred when the teacher entered the schools in which he or she would teach. Zeichner and Gore (p. 332) designated these three periods of teacher socialization as "prior to formal teacher education, during preservice education, and during the inservice years of teaching."

Brown and Borko (1992) painted a rather bleak picture of the role of socialization as it applied to early career teachers using reform-based teaching practices. Current reform-based mathematics teaching ideas vary radically from the K-12 classroom experiences of most early career teachers. Brown and Borko suggested that "novice teachers most likely will not implement innovations in either the mathematics curriculum or teaching practice unless those innovations are also part of the culture of the schools where they learned and where they teach and learned to teach" (p. 223). Research suggested that early career teachers will utilize teaching methods similar to those that their own teachers used unless university courses and field work can succeed in changing their preexisting ideas.

Socialization Prior to Formal Education

In his classic 1975 book *Schoolteacher: A Sociological Study*, Lortie coined the phrase 'apprenticeship of observation' (p. 61). This phrase was widely used by other researchers to describe that period of time when one was a K-12 student. Lortie stated that teachers have logged over 2000 hours of apprenticeship while observing teachers teach (p. 61).

Lortie's views on socialization aligned with this paper's theoretical perspective of symbolic interactionism. Lortie (1975, p. 62) stated, "students learn to 'take the role' of the classroom teacher, to engage in at least enough empathy to anticipate the teacher's probable reaction to his behavior. This requires the student to project himself into the teacher's position and imagine how he feels about various student actions." Tied to the theories of symbolic interactionism, when the students observed the teacher they actually interpreted the teacher's actions based on their own personal feelings toward his or her actions. If a student had decided that he or she wanted to be a teacher they may 'take this role' even more seriously. The perspective of many that 'anyone can teach' may arise from these experiences.

Lortie (1975) proposed that veteran teachers make the job of teaching look easy. In their immaturity, students do not realize the constant experienced-based decision making that is occurring. They do not see the planning and preparation that precede a successful lesson. Lortie reported that new teachers often commented that teaching was much more difficult than they expected it to be. He credited this common revelation among early career teachers to the misconceptions conceived during the 'apprenticeship of observation.'

Zeichner and Gore (1990) expanded on Lortie's (1975) view of prior experiences. They suggested that all of us teach each other every day. Parents teach children, babysitters teach their young charges, Sunday School teachers guide church lessons and employers teach employees new job skills. Without this continual teaching, Zeichner and Gore stated that human survival would not have been possible. These shared experiences again strengthen that idea that 'anyone can teach' and further strengthen the power of prior socialization.

In relating the power of prior experiences to the teaching of math, Ball (1990a) stated that one's "experiences have often persuaded them that mathematics is a fixed body of rules, a dull and uninteresting subject best taught through memorization and drill, and that they themselves are not good at math" (p.11-12). In her opinion, past experiences may "inhibit open-mindedness" and "limit our possibilities for continued learning." Powell (1992, p. 225) noted that "it [prior knowledge of teaching] serves as a filter for interpreting new information about teaching that is acquired during teacher

preparation.” Flores (2001) reported that early career teachers even stressed that “negative episodes” (p. 138) from their own K-12 experiences impacted their current classroom practices. In these statements, Ball, Flores, and Powell reiterated both Lortie’s (1975) and Brown and Borko’s (1992) concerns about the difficulty of breaking a pattern of traditional teaching that has existed for centuries.

In Lortie’s (1975) opinion, university courses have little chance of altering these early views. The positive and negative habits and beliefs developed over thirteen years of observation of teachers remain much more powerful than the influences of either college courses or school-based experiences. Brown and Borko (1992, p. 222) agreed that “research suggests that early experiences exert a powerful influence on the images future teachers have of teachers and teaching, and that these images continue to influence teachers even once they have assumed the role of teachers themselves.”

Socialization During Preservice Education

According to Zeichner and Gore (1990) the preservice education experience can be divided into three time frames. The student first experiences courses outside of the education department. These would include general education courses and specialization courses, for example math courses taught by math department faculty. The second set of experiences includes methods and foundation courses taught by faculty in the education department. Field-based experiences in school classrooms represent their third set of experiences. Zeichner and Gore also suggested that the general college experience could be counted as a fourth impact. Because methods courses are a main focus of this dissertation, the research on the impact of methods courses will be further expanded in the Methods portion of this literature review. This section will address socialization issues of college coursework as a whole.

A commonly accepted claim for many years (Nucci & Pascarella, 1987; Pascarella, 1985) was that colleges exerted a progressive socialization experience on preservice teachers. In other words, research supported that students came to university programs with traditional views, became more progressive during their years at the university, then reverted back to traditional viewpoints during their inservice experiences. According to this view, the major source of responsibility for early career teacher’s return

to conventional views was the school environment. Universities were generally absolved of all responsibility in this decline.

Zeichner and Gore (1990) questioned the widely-held viewpoint that university programs played no role in supporting traditional teaching practices. Their reservations were grounded in the premise that the college years could be considered a continuation of Lortie's (1975) 'apprenticeship of observation'. They cautioned against generalities about university programs as these vary so greatly from campus to campus. However, they surmised that many of the courses taken before a student begins the methods and foundation courses were likely taught in a non-reform based manner. Though they acknowledged that reform-based courses might be more likely to exist in the education departments they cautioned that here too there existed great variation in pedagogy. They also theorized that, during the field-based experiences in school classrooms, many mentors and supervising teachers did not teach in a reform-based manner.

The overarching theory presented was that perhaps universities did not practice what they preached (Feiman-Nemser, 2001). Though professors might stress the benefits of reform-based teaching practices, students were likely to be experiencing another four years of observing very traditional pedagogy. Preservice teachers could not imitate and reflect on reform-based teaching practices if methods instructors were not providing exemplary examples of such practices. As stated by Manouchehri (1996, p. 10), "It is only reasonable to assume that modeling the kind of instructional behaviors desired from prospective teachers will be the core of the theory of education." However, many argue that this is not the case.

Though students might be creating reform-based lesson plans and writing papers on the power of progressive methodology in order to accommodate assignment requirements, their belief systems might remain very traditional. Flores (2001, p. 139) surmised that though students might disagree with their supervisors' approaches, they would "follow their professional behaviors, maintaining, at the same time, personal reservations about them."

Other researchers have presented additional perceptions of why college programs may not be successfully socializing students. In Flores's 2001 longitudinal study, teachers reported the "gap between theory and practice" (p. 138) in education classes.

Professors were presented by teachers as being unfamiliar with the real world of teaching. Flores suggested that a more “articulated and holistic” (p. 146) view of teaching needed to be incorporated into teacher training programs.

Both Marks (2007) and Flores (2001) also noted issues with adequate supervision of field experiences. Lack of quality supervision was listed by teachers from their studies as a deterrent to a successful change of beliefs during university teaching experiences. General suggestions included that supervisors be more knowledgeable and supportive. Marks also suggested that preservice teachers often come to education programs with inflated view of their own teaching abilities. Because of this overconfidence in their own abilities, they “do not accept or internalize university teachings because they do not value them as necessary” (p. 2). Strong field supervisors must honestly assess preservice teachers’ performances in the classroom and be able to support those evaluations. When students received good grades for poor performances in the field it further supported their self-assured views of their own teaching (Marks). Effective supervision is especially important if student observation and teaching experiences occur, as they often do, in classrooms where the mentor teacher teaches in a manner similar to the preservice teachers’ own traditional K-12 experiences. Cochran-Smith and Zeichner (2005) stated that when teaching practices in field sites supported the practices being encouraged by the education departments, it was much easier for preservice teachers to implement reform-based practices.

Zeichner and Gore (1990, p. 332) stated, “Preservice education must address predispositions of students in order to alter pedagogy beliefs.” They not only suggested that belief systems must be addressed in preservice programs, but laid further responsibilities on teacher educators. They challenged education faculty to not only make changes within programs, but also to work within “institutional, social, and political contexts” (p. 343) to institute change. They noted the necessity of pursuing these two avenues in order to improve teacher education programs.

Socialization During the Inservice Years

The socialization impact of an early career teacher’s first years in a new school have also been widely researched. However, unlike the questionable impact of the preservice years, multiple studies (Brown & Borko, 1992; McGinnis & Parker, 2000;

Roberts, 2006) support the influence of schools on instruction and beliefs. Sirotnik (1983, p. 17) suggested “If the novice teacher enters a school that supports different styles of teaching, the findings on teacher socialization are positive. However, the profound influences upon new teachers by colleagues and administrators who do not support reform-based teaching can be troublesome for the novice teacher located in a traditional mathematics culture.”

McGinnis and Parker’s 2000 research on first year teachers confirmed that an early career teacher’s use of reform-based mathematics teaching strategies was largely determined by his or her school situation. The use or non-use of reform-based pedagogical practices was very dependent on whether these practices were supported by the schools in which the new teachers found themselves. Roberts’ (2006) and Feiman-Nemser’s (1986) research supported that, even if the teacher education program had a significant impact on the beliefs of a student, the early career teacher faced the realities and many challenges of maintaining those beliefs once they began a teaching career.

Many factors in a school atmosphere influenced an early career teacher’s socialization. Principals, administrators and other evaluators can have significant impact on new teachers (Zeichner & Gore, 1990) even though effective mathematics teaching might not fall in their areas of expertise. Previously chosen traditional textbooks may guide a district’s curriculum practices. Parents and students, with preconceived notions of mathematics teaching, may challenge a new teacher’s reform-based or standards-based practices. Roberts (2006) stated that though instructional strategies chosen by early career teachers were influenced by multiple factors, other teachers’ ideas had the strongest impact. Veteran teachers may be unfamiliar or uncomfortable with standards-based ideas. They may also simply be settled into traditional practices. These veteran teachers are most often the ones that early career teachers turn to for advice. These same veterans are often assigned as mentors for the novice teachers, placing them in the position of offering advice and support.

Whether a school supports reform-based or traditional practices has a profound effect on an early career teacher’s instructional strategies and on his or her belief in the efficacy of his or her choices. Findings from Flores’s study (2001, p.145) “strongly support the idea that the workplace plays a crucial role in shaping new teachers’ attitudes

toward teaching.” School context was a major factor in whether reform-aligned teaching was regularly implemented. Beliefs developed prior to education and during preservice education impact teacher choices, but are not always powerful enough to withstand the scrutiny and criticism of others. As early career teachers socialize into a new school, they must be aware of the culture of that school before seeking or following advice concerning reform-based ideas.

Socialization Conclusions

Many experts in teacher socialization (Brown & Borko, 1992; Flores, 2001; Lortie, 1975; Roberts, 2006; Zeichner & Gore, 1990) draw similar conclusions concerning its impact on reform-based ideas. Early career teacher’s beliefs and practices are strongly influenced by both their K-12 experiences and by their workplace situations. However, the impact of college education programs is much less significant. In fact, the college education program may exert a negative socialization influence. Best expressed by Brown and Borko (p. 227), “Unless novice teachers experience good mathematics as students, see it modeled by teachers they respect, and are situated in a culture of teaching that accepts and practices good teaching, it will be difficult for them to implement and maintain reform-based teaching in their classrooms.” University education programs must be aware of and address the issues associated with socialization if early career teachers are to be able to effectively face the challenges of their inservice years.

Zeichner and Gore (1990) supported this researcher’s theoretical framework goals with comments supportive of the theories of symbolic interactionism. Holding that “Research concerned with teaching and teacher education has rightly been criticized at times for being research on rather than for the people who are studied (teachers, students, teacher educators) there is need to develop new and more interactive methods of conducting research that illuminate teachers’ perspectives of their own development” (p. 342-343). Zeichner and Gore further stated that, “A priority in teacher socialization research needs to become one of finding ways to use our research studies to enhance the lives of those who open themselves up to us in these studies.” (p. 343). This researcher has supported those goals by allowing early career teachers an opportunity to share their

ideas on the impacts of their methods courses on their teaching. Further, the results will be used to guide this researcher as an elementary mathematics methods professor.

Early Career Teachers' Use of Traditional vs. Reform Teaching

The heart of this current study lies in the research that a large percentage of early career teachers use traditional practices in their classrooms (Flores, 2001; Hart, 2001; Raymond, 1997). This phenomenon may be the result of the 'apprenticeship of observation' (Lortie, 1975) or it may occur because of the impact that evaluators, curriculum or veteran teachers have during novice teachers' early inservice experiences (Flores, 2001; McGinnis & Parker, 2000; Zeichner & Gore, 1990). It may also be the result of university programs that do not adequately address prior beliefs, evaluate effectively, and/or prepare teachers for the reality of the classroom (Flores, 2001; Marks, 2007; Zeichner & Gore, 1990).

The list of possible culprits is extensive with research supporting and research disparaging each viewpoint. Roberts (2006, citing Simon, 2000) explained the challenges of research on reform-based teaching in mathematics teacher education, "Since we do not have a deep understanding of how beginning teachers develop reform based instructional techniques and there are not sufficient examples in place to learn from, we are in a situation of trying to understand a process that is currently largely unrealized. (p. 29) In other words, in this particular area of research, we have a hard time explaining why early career teachers either mimic the traditional practices of their past school experiences or revert back to traditional practices after experiencing some level of reform-based preservice program.

Socialization (by other names)

Multiple researchers have examined the circumstances surrounding traditional teaching practices. Many applied socialization reasoning, but used other terms to describe the trend toward traditional teaching. Capraro and Capraro (2005) referred to the *beliefs* developed through years of school attendance and during preservice courses. In their research they studied the impact of those beliefs on practice. Raymond (1993), too, linked beliefs and practices, referring to beliefs as *driving forces* in teacher choices. Levine (1993) spoke of the *impact* of K-12 and preservice experiences and stressed the

importance of examining the extent to which these experiences influenced teaching style. Feiman-Nemser (2001, p. 1014) referred to all levels of socialization. “The typical preservice program is a weak intervention compared with the influence of teachers’ own schooling and their on-the-job experience.” No matter what the terminology or name assigned, researchers concur that the early years of teaching are challenging.

Additional Challenges for Early Career Teachers

Aside from blaming socialization, the many challenges faced by early career teachers may cause them to simply revert back to teaching strategies that feel safe to them (Veenman, 1984). LaBerge and Sons (1999, p. 151) noted that “these students are being asked to do something that is difficult: they are being asked to teach in a manner that for most of them represents a radical change from the way they were taught mathematics.” It may be that early career teachers begin the year using more standards-based methods and, if these methods are effective, they may adjust and retain them. However, depending on individual commitment and strength, disappointment and disenchantment may cause these teachers to enter survival mode and revert to pedagogy that feels less stressful to them (Roberts, 2006). Simply maintaining classroom control and following a textbook’s curriculum may feel like all they can handle.

Many factors may cause an early career teacher to choose safe, traditional practices. Among those factors most often cited in research were supplies and curriculum materials, either in insufficient number or with a very traditional inclination. In some schools, administrative stress was put on the unaltered use of the school’s curriculum. This pressure took away at least part of some new teachers’ choice in pedagogy. (Cady, Meier, & Lubinski 2005b; McGinnis & Parker, 2000; Steele, 2001; Sullivan & Leder, 1992). Also mentioned were high-stakes testing and the effects of assessment (Tsuruda, 1994). The pressure of anticipated test results led many teachers to parallel teaching methods with the high-stakes test format (Cady, Meier, & Lubinski; Tsuruda, 1994). Required practice tests and tutoring sessions required both altered teaching strategies and time.

Time for planning and teaching were both mentioned as affecting the use of reform-based practice. The time needed to prepare, adequately assess student work, plan

for student differences, and reflect on successes and failures directly impacted teaching methods (Cady, Meier, & Lubinski, 2005b; LaBerge & Sons, 1999; McGinnis & Parker, 2000). A prepared curriculum was an easy method on which to fall back when time and/or energy did not allow for plans requiring more effort.

Classroom management issues were often mentioned as contributing to the abundance of traditional methodology. Discipline problems, whether related to activity-based teaching pedagogy or to general classroom organization, were listed by teachers as barriers to reform-based teaching (LaBerge & Sons, 1999; McGinnis & Parker, 2000; Ryan, 1986). Besides management issues associated with behavior, adverse reactions from students and parents concerning new classroom practices, curriculum content, and/or assessment techniques were also listed (Sullivan, 1989; Sullivan & Leder, 1992; McGinnis & Parker). Students' negative comments or refusal to participate in activities particularly affected early career teachers who were already uncomfortable with reform-based or standards-based practices. First year teachers tended to equate good classroom control with good teaching. (Sullivan, Sullivan & Leder). In Sullivan's research, first year elementary teachers struggled to implement the NCTM standards in their classrooms. Because of their struggles with classroom control, Sullivan (p. 15) concluded that the "slow pace of reform is possibly more a result of the need to maintain a stable and harmonious classroom" rather than "inappropriate or inadequate knowledge of teaching and learning."

Other issues associated with early career teachers' use of traditional pedagogy can be directly linked to the essence of college methods courses. Inadequate content knowledge, lack of understanding of standards-based pedagogy and/or unchanged belief systems can all play a role in the use of traditional practices. The "contextual constraints that exist in real schools" (Roberts, 2006, p. 26) must also be addressed in methods courses. Methods courses need to "prepare new teachers for the challenges they will likely face in trying to teach in a non-traditional manner" (Roberts, p. 26). Early career teachers' beliefs systems play a crucial role helping them face these challenges. The connection between content knowledge and standards-based beliefs and practice are crucial to effective teaching and, therefore, should be stressed as we prepare preservice

teachers. Each of these areas will be further addressed in the Methods section of this chapter.

Elementary Mathematics Methods Courses

Introduction

Spielman and Lloyd (2004) noted that changing preservice teachers' beliefs about mathematical and pedagogical concepts should play a major role in teacher education programs because these concepts, in turn, play such a major role in preservice teachers' future classroom practices. Stronger content knowledge, reform methodology taught and modeled in all phases of the program, and discussions on beliefs were noted as ways to strengthen teacher preparation. Research on each of these areas will be integrated to draw conclusions about the ultimate responsibilities placed on elementary mathematics methods professors.

Impact of Methods Courses

Supports and Denials

Research both supports and denies the positive influence of mathematics methods courses on teacher quality, beliefs and practices. Many issues that might limit an early career teacher's use of reform-based practices can be positively impacted in teacher education programs (Clift & Brady, 2005; Hansen, Schalock, McConney, & Rudd, 2001; Robinson & Adkins, 2002). However, research also exists that methods' teachings were 'washed out' in the early years of teaching or had limited success at changing preservice teachers' beliefs (Cady, Meier, & Lubinski, 2005b; Clift & Brady, 2005; LaBerge & Sons, 1999, Zeichner & Gore, 1990).

Zeichner and Gore, in their comprehensive 1990 review of teacher socialization and its impact on preservice and inservice teachers, reflected on research supporting both the positive and negative impact of methods courses on teacher practice. In the end they challenged the "commonly accepted views that professional education courses have little impact on teacher education students" (p. 337). Though their review of research showed that information introduced in some methods courses had little influence on some preservice teachers' actions, other students' responses reflected change. Zeichner & Gore

warned against accepting findings of no impact because current studies indicate that some impacts may be greater than originally thought.

In a subsequent 2005 report on methods courses and field experiences for all subject areas, Clift and Brady identified studies specifically focusing on preservice mathematics education. Twenty studies were found that had been published between 1995 and 2002. Sixteen of these twenty studies concentrated on elementary preservice education. Within this comprehensive review of research, some (about half) reported a positive impact of elementary mathematics methods program while others supported either no impact or mixed results.

In the Clift and Brady (2005) report, 9 of the 20 original studies, including research by Kelly (2000), Kim and Sharp (2000), and Kinach (2002), reported positive impacts of methods courses. Positive influences were noted, among others, in “beliefs about mathematics, abilities to write lesson plans, and demonstrating a knowledge of constructivist principles” (p. 318). Ten studies, including Ebby (2000), Frykholm (1996), Steele (2001), and Vacc and Bright (1999) reported mixed results. Only Foss and Kleinsasser (1996) described completely negative results. It should be noted that, of these 20 studies, only Steele (2001) tracked teachers in their inservice years. The rest reported on changes occurring during the preservice years.

Clift and Brady (2005) concluded that “changing the preservice teachers’ views of teacher as authority and provider of knowledge to teacher as facilitator and coinvestigator with students is, at best, difficult to put into practice” (p. 319). Variations in programs, students, and research methods made drawing final conclusions difficult. This researcher discovered findings similar to Zeichner and Gore and to Clift and Brady in that reviews are mixed on the impact of methods courses on practice.

On the ‘pro-methods’ side, Darling-Hammond (2003) reported that early teachers who received adequate preparation in their college programs intended to stay in teaching longer and actually did remain longer. Adequate preparation included areas such as training on writing lesson plans and on the use of a variety of instructional methods and assessment techniques. As in the Darling-Hammond report, Hansen, Schalock, McConney, and Rudd’s 2001 findings related to generalized experiences – not just math. Sixty-five first year teachers in grades K-5 were observed to determine, in part, if

preparation programs modified their practice or beliefs. Results were described as “encouraging” in relation to “specific observable teacher practices, in a standards-based framework” (p. 18).

Support for positive impacts from methods courses were also found in studies focusing specifically on the teaching of mathematics. Judson and Sawada (2001) and Robinson and Adkins (2002), each researching their own programs, drew similar conclusions based on the premise that teachers teach as they are taught. In each case, college educators modeled standards-based teaching in their methods courses and then assessed the beliefs and reactions of their students. Robinson and Adkin’s subjects were K-8 preservice teachers while Judson and Sawada reported on science and math teachers for grades 5-12. Allowing students to experience a course based on the NCTM standards resulted in students who taught in a significantly more reformed manner.

This researcher found the study by Valli, Rath, and Rennert-Aviev (2001) to be of special interest. As is my current research, it was a survey study and was conducted on first, second and third year teachers. Teachers from grade three through eight were asked about their preservice and induction learning experiences. Basic findings were positive, indicating that the early career teachers were more successful if they “believe teachers can have an impact on student learning, help students make sense out of mathematics, were taught how to do this in their teacher preparation program, and received continued support in their first years of teaching by an experienced mentor” (p. 6)

On the ‘con’ side of the impact of methods courses, Lortie (1975), in his classic and often-referred to book *The School Teacher*, noted multiple reasons why teacher education programs have no impact. Unlike students in preparation programs for most professions, education students have observed adults in their chosen profession for thirteen years. They often think that they already know how to teach and therefore view much of their coursework as unnecessary. They are more likely to critique professors’ ideas as too focused on theory and not applicable to the real experience of teaching. These convictions make it difficult for methods courses to influence preservice teachers’ beliefs and practices.

LaBerge and Sons’ 1999 research supported Lortie’s predictions. They followed 12 secondary mathematics teachers through their methods courses and their first year of

teaching. The methods course focused on the NCTM Standards and the professors modeled practices supportive of the standards. However LaBerge and Sons reported, “Despite the fact that these FYTs [first year teachers] completed a program specifically designed to support and encourage its graduates in implementing the NCTM standards, by their own report, the FYTs studied had limited success in achieving this goal.” (p.151)

Cady, Meier, and Lubinski (2005b) noted similar results in their study of K-8 teachers in their early years. They concluded that the learning environment in which preservice teachers spent their final year of preparation had little impact on them as first year teachers, in either their beliefs or intellectual development. However, because of the longitudinal nature of their study, these same teachers were revisited in their fifth year of teaching. At this time many of the teachers’ beliefs and practices had continued to develop. Though teachers noted that professional development had also impacted their practices, credit was extended to the experiences in preservice education. Cady, Meier, and Lubinski surmised that the first year teachers needed time to adjust to their new roles and environments. Following this adjustment period they became more confident and were able to place more focus on being effective teachers. This researcher has found no other research supporting or denying this claim.

Bramald, Hardman, and Leat, (1995) reiterated the views of Zeichner and Gore that preservice training should not be noted as a constant, but instead as a variable. Methods courses vary, students in those courses vary, and as such, results will vary. Based on this variation, they argued against some of the pessimistic findings on the effects of preservice courses. They concluded that, “Further work, therefore, needs to be carried out to understand the variables that influence teacher thinking so that they can be incorporated into course designs, and to identify more accurately the types of students capable of the higher levels of reflection at the selection stage” (p. 30). This researcher’s current survey allowed early career teachers to share their thinking and, in doing so, inform future decisions about teacher preparation.

Feiman-Nemser (2001, p. 1021) stated that “the obstacles to effective teacher preparation are legion.” Among other hindrances to improvement she listed the low status of teacher education program in universities and the low status of teachers in our communities. Limited resources and overregulation by state agencies further hampered

development. Lortie's 1975 study cautions about the power of the 'apprenticeship of observation'. His beliefs are reiterated by current researchers (Flores, 2001; Marks, 2007). Literature on beliefs expounds on the power of belief systems and the difficulty in changing beliefs. Raymond (1997, p.574) stated that the average one or two semester methods course was not sufficient to "effect lasting changes in beliefs." In describing the types of pedagogical knowledge needed by teachers, NCTM in their 2000 Principles and Standards for School Mathematics stated that, "This kind of knowledge is beyond what most teachers experience in standard preservice mathematics courses in the United States" (p. 17).

Universal Call for Change

With these concerns and others, NCTM and researchers on both sides of the methods debate have issued a call for improvement in U.S. teacher preparation programs (Flores, 2001; Gold, 1996; LaBerge & Sons, 1999). The quality of teaching in today's schools depends on the quality of the nation's teachers. In order to have these quality teachers we must offer them "powerful learning opportunities" (Feiman-Nemser, 2001, p.1013). According to NCTM these opportunities need to prepare early career teacher to learn – "from their own teaching, from their students, from curriculum materials, from colleagues, and from other experts." (NCTM, 2000, p. 370)

Professors' practices in teacher education programs need to reflect the standards-based theories that they espouse. Manouchehri (1995) suggested that current teacher education programs are "simply derivatives of the old and somewhat obsolete methods of instruction" (p. 14). Contrary to standards-based ideas, most students are viewed as passive learners with the lecture method of instruction being common. According to Manouchehri, "It is essential for teacher education programs to examine their state and look even more carefully at their weaknesses. Teacher education programs will need to create a community in which messages and forces are consistent and compatible with the vision of teaching being promoted" (p. 16).

The National Commission on Mathematics and Science, in its report *Before It's Too Late: A Report to the Nation from the National Commission on Mathematics and Science Teaching for the 21st Century* (2000) laid forth multiple goals to enhance the

teaching of math and science in grades K-12. Some goals applied to inservice teachers, but one specifically applied to preservice teachers. This goal was two-fold – to appreciably raise the number of mathematics and science teachers and to improve their preparation. The report partially blamed teacher preparation programs for the current teacher shortage in mathematics and science stating:

The negative impact of the teacher shortage is compounded by the diffuse and therefore uneven quality of the education delivered by teacher preparation institutions. The sad fact is that many teacher preparation programs do not build an adequate knowledge base in their graduates. An aggressive recruitment program, therefore, must be accompanied by an equally aggressive, and simultaneous, effort to improve teacher preparation.” (p. 29-30)

A more current group, the National Mathematics Advisory Panel, under the auspices of the U. S. Department of Education, reiterated the call for improvement in teacher preparation. The Final Report of the National Mathematics Advisory Panel (2008) recommended that the preservice education programs for “elementary and middle school teachers must be strengthened” (p. 38). In a separate recommendation they noted the need to “identify the mathematical and pedagogical knowledge needed for teaching” (p. 38). The panel also commented on the need for research that would enable the creation of a “sound basis for the mathematics preparation of elementary and middle school teachers within preservice teacher education” (p. 38). Results of this researcher’s current survey will, hopefully, add to that research platform.

This change in preservice teacher preparation will not be easy. Changes must occur at all levels of preparation, including content courses, methods courses, and field-based experiences. LaBerge and Sons (1999) noted the challenges involved in order to accomplish this goal. “Making changes in instructional practice and programs means taking risks. If teacher education programs intend to prepare graduates who are willing to take risks, to make changes, to take responsibility for their continued learning, to seek out information , and to assume leadership roles, the university faculty and others involved in teacher preparation must exhibit the same willingness.”(p. 154)

Methods Course Components

The theories and ideas concerning the best way to prepare elementary teachers to teach math vary widely. Common among them are that preservice elementary teachers should be required to take four years of higher math or that courses should be designed specifically for elementary majors or that anyone who can do math can teach math. Those concerned with this issue, including this researcher, have read Brownell, Piaget, Shulman, Ball, the NCTM standards and others in an attempt to reconcile the wide range of opinions. All want to find the best methods for preparing elementary teachers to address the mathematical needs of young learners who are facing a future where a true and deep understanding of mathematics is an important key to their future.

The need for change in teacher preparation is apparent on many levels. “In reality unless a ‘mechanism’ for reform is found in mathematics teacher education, even current guidance will not make an impact on the teaching of mathematics.” (Manouchehri, 1996, p. 3). Various models for teacher preparation courses have been developed through the years to meet this need, most being focused around a training model.

Joyce (1988) developed such a model, stressing that training allows new teachers to learn skills that they would not otherwise acquire. The four components of her model involved the study of theory and research, demonstrations of teaching skills, practice of those skills and reflection on those skills. Cooney (1994) also suggested a training model. Cooney’s model included providing the necessary knowledge, addressing beliefs, addressing challenges faced by teachers, providing contexts to practice assessment of student learning, and allowing the preservice students to develop teaching strategies based on their mathematical knowledge.

Cruikshank and Metcalf (1990) argued that it is the responsibility of teacher education departments to “develop and implement appropriate training regiments” (p. 473). Based on a synthesis of research on teacher training they compiled a list of 15 essential principles of teacher training. Principles included the necessary components of assessing current skill levels of students, demonstrating new skills, and providing opportunities for practice both within the course and in a natural setting. The importance of instructor feedback was noted following all practice sessions.

Central Tasks of Preservice Preparation

Feiman-Nemser (2001) developed a model that not only applied to methods courses, but also for provided a framework for the support of early career teachers. Recognizing the need for a continuum of learning opportunities for early career teachers (McCormack, Gore & Thomas, 2004), Feiman-Nemser developed the Central Tasks for Learning to Teach (CLTL). Her framework included five central tasks of preservice preparation, five central tasks of teacher induction (normally the first three years), and four central tasks of early professional development (in the 3rd to 5th years of teaching). Her design rested on “a single premise with far-reaching consequences- if we want schools to produce more powerful learning on the part of students we have to offer more powerful learning opportunities to teachers.” (Feiman-Nemser, p. 1013-1014).

This review will focus on the first section of Feiman-Nemser’s (2001) continuum, those tasks dealing with the preservice preparation of teachers. Her five central tasks of preservice preparation included: developing subject matter knowledge for teaching, developing an understanding of learners and learning, developing a beginning repertoire of instruction and assessment strategies, analyzing beliefs and forming new visions about what good teaching entails, and developing the tools to study teaching. According to Feiman-Nemser, preservice teachers, prepared according to these tenets, can find success in their classrooms. She did, however, offer a caveat to this theory. She stated that success would be dependent on early career teacher induction programs continuing to build and extend on these five tasks. In other words, attention would still need to focus on her other two sets of tasks, the support of new teachers and the professional learning of these teachers for a minimum of the first five years of their teaching.

Feiman-Nemser (2001) presented all sections of the Central Tasks for Learning to Teach to encourage discussion on the radical idea of revamping teacher learning. Noting the misfit between current teacher preparation and the “challenges of learning to teach in reform-minded ways” (p. 1014), she suggested the need for a complete overhaul of our teacher preparation system. As do the other teacher models described earlier, Feiman-Nemser’s (2001) model is applicable to teacher preparation in all content areas. However, unlike the other models, Feiman-Nemser specifically addressed reform teaching practices. She spoke of preservice preparation being a time to develop skills for “reform-

minded teaching” (p. 1018). This focus on reform practices parallels the goals of the current research study. As such, her model was chosen by this researcher as a basis for discussing the components of an elementary mathematics methods program that focuses on standards-based practices. Her five tasks served as an organizational tool for both the review of literature and the associated survey questions. On this researcher’s survey, questions pertaining to the benefits of the early career teachers’ methods courses were divided into Feiman-Nemser’s five tasks of preservice preparation as were questions pertaining to suggestions for improving elementary mathematics methods.

Following is a description of Feiman-Nemser’s five tasks of preservice preparation, based on her perspectives. Included in each section is a review of literature as it pertains to each topic and a summary of the associated survey questions. Please refer to Table 3.1 for clarification.

Developing Subject Matter Knowledge for Teaching

Multiple factors contribute to good teaching of mathematics, but subject matter knowledge, in some form, is always included in any researcher’s list. In line with this theory, Feiman-Nemser included subject matter knowledge in her five necessary tasks for preservice preparation. She inventoried the subject matter knowledge needed for teaching including knowledge of central facts, concepts and procedures and the frameworks that connect them. She also referenced the pedagogical aspects of being able to provide multiple explanations, assessing and addressing student misunderstandings, and being able to connect real life and mathematical ideas. Additionally, she included the teacher’s need to be familiar with suitable curricular materials.

As do many researchers, Feiman-Nemser (2001) referenced Shulman’s (1986) description of subject matter knowledge. Shulman suggested that his three designated areas of content knowledge - subject matter knowledge, pedagogical content knowledge, and curricular knowledge - all play a role in defining a well prepared teacher of mathematics. Pedagogical content knowledge (PCK) became an educational “buzzword” used by many researchers to describe the subject matter needed for teaching. Shulman pointed out that PCK is the knowledge that separates one who can teach a subject from one who simply knows the subject. Shulman seemed to want to end the historical debate

of the importance of content over pedagogy or pedagogy over content by intertwining and stressing the importance of both in preparing teachers.

Many researchers define PCK by delineating knowledge that it includes. Shulman (1986) included knowing representations and examples that make a subject understandable to others. He also felt that teachers needed to understand misconceptions, and which areas are more difficult to understand and why. Gold (1996) suggested that PCK involved understanding the structure of the subject. Teachers should be prepared to present the material using a variety of instructional materials and be able to provide students with a number of analogies and illustrations. Simply stated, a teacher should be capable of presenting content in a form that students can understand. Fennema and Franke (1992) added understanding the preconceptions that students are likely to bring with them as they face a new concept.

The importance of subject matter knowledge is reflected in NCTM's 2000 *Principles and Standards of School Mathematics*. Six main principles frame the groundwork for these standards. One of these, the teaching principle, repeatedly addressed the issue of teacher preparation, stating that teachers need several types of knowledge. "Effective teaching requires *knowing and understanding* mathematics, students as learners, and *pedagogical strategies*" (p. 17). "To be effective, teachers must *know and understand* deeply the mathematics they are teaching and be able to draw on *that knowledge* with flexibility in their teaching tasks" (p.17). "Teachers need several different kinds of mathematical knowledge – [...] deep flexible knowledge" about curriculum goals, main ideas for their grade level; what will be most difficult for their students, how to plan ahead, representations, and how to connect math to prior knowledge and future math (p.17).

Obviously NCTM has embraced the importance of subject matter knowledge, but it has taken the research and writing of a few individuals to bring this issue to national attention. Deborah Ball has conducted numerous studies involving classroom teachers and has greatly expanded our understanding of the type of knowledge needed by classroom teachers. Ball (1990b) calls this substantive subject matter knowledge. Substantive knowledge includes knowledge of concepts and procedures, an understanding of underlying principles (the whys) and the connections among math ideas.

Liping Ma (1999), in her comparisons between Chinese and United States teachers, made many question U. S. preparation programs and the lesson planning support provided for practicing teachers by colleges, colleagues, and textbook authors. She suggested that U. S. teachers lack, but need, a more profound understanding of fundamental mathematics (PUFM). Without PUFM these teachers are incapable of developing examples, providing the representations, and allowing the inquiry that research supports as necessary for students to move beyond basic arithmetic skills.

Elizabeth Fennema and partners have done extensive research on the topic of teacher knowledge. The majority of this research has centered on working with practicing teachers. In 1992, Fennema and Franke described a research model for examining the integration of teacher knowledge based in part on this extensive research. Of the four components, two centered on subject matter knowledge - knowledge of mathematics content and knowledge of mathematical representations. The other two related to knowledge of the learner, which parallels Feiman-Nemser's (2001) 'Learner' task, and to teaching and decision-making skills, relating to Feiman-Nemser's 'Repertoire' task.

Profound understanding of the mathematical content being taught is crucial to being able to effectively teach even elementary math concepts (Ball, 1990b; Ma, 1999). Hart (2001) reported that students' lack of content knowledge made early career teachers unconfident in using the standards-based methods with which they had been prepared in their university program. She concluded that a deep understanding of mathematics is required in order to teach within a reform philosophy.

In rewording the famous quote from George Bernard Shaw "Those who can, do. Those who can't, teach", Shulman wrote, "Those who can, do. Those who understand, teach." (Shulman, 1986). Preservice teachers must be encouraged and allowed to develop a deep conceptual understanding of the mathematics that they will be teaching in order to use the reform-based pedagogy that we are expecting of them. As indicated on Table 3.1, two survey questions, #9 and #15, directly related to developing an understanding of subject matter knowledge for teaching.

Developing Understanding of Learners and Learning

Feiman-Nemser (2001) divided this section into two main preparation areas for preservice teachers. First, she stressed that teachers must “develop a pedagogical stance rooted in knowledge of child/adolescent development and learning” (p. 1018). Teachers must understand the differences in students that are related to their age, their culture, and their social settings. These skills are necessary in order to choose, utilize, and justify suitable teaching activities.

Second she noted the importance of diversity training. The worlds represented by today’s students often vary markedly from those of new teachers. Early career teachers must be able to relate to the variety of ethnic, cultural, or socioeconomic backgrounds represented by students in their classrooms. Teachers must understand the importance of connecting learning to their students’ families and to the communities in which they teach.

NCTM supported the necessity of understanding students and students and students as learners in their 2000 *Principles and Standards for School Mathematics*. In the third of the six principles on which the standards are grounded, the Teaching Principle, several quotes conveyed this message. “Effective mathematics teaching requires understanding what students know and need to *learn* and then challenging them to *learn* it well” (p.17). “Effective teaching requires knowing and understanding mathematics, *students as learners*, and pedagogical strategies” (p.17).

NCTM’s Equity Principle from *Principles and Standards for School Mathematics* (2000) also addressed these issues. “Teachers need help to understand the strengths and needs of students who come from diverse linguistic and cultural backgrounds, who have specific disabilities, or who possess a special talent or interest in mathematics” (p. 14). “To accommodate differences among students effectively and sensitively, teachers need to understand and confront their own beliefs and biases” (p. 14). Another principle, the Learning Principle further addressed Feiman-Nemser’s choice of learning by supporting that students can learn with understanding if they are challenged with appropriate tasks and are allowed to actively engage in the learning process.

Magnusson, Krajcik, and Borko (1999) designated this type of knowledge as one of four components of Teacher Knowledge. Their initial categories of Subject Matter Knowledge and Pedagogical Knowledge linked to form Pedagogical Content Knowledge

(PCK), somewhat in line with Shulman's designations of teacher content knowledge. However, Magnusson, Krajcik, and Borko's model made one further connection – from PCK to Knowledge about Context. This fourth knowledge category included students, school, community and district. These four subcategories reinforced Feiman-Nemser's description of her category of Understanding Learners and Learning.

As indicated on Table 3.1, two survey questions, #10 and #16, directly related to developing an understanding of learners and learning.

Developing a Beginning Repertoire

In relation to this third task for preservice teachers, Feiman-Nemser (2001) referenced Wasley, Hampel, and Clark's (1997) list of suggestions for skills needed by a beginning teacher. Their repertoire included "techniques, skills and approaches" applicable to "curriculum, instruction and assessment" (p. 45). In her examples, Feiman-Nemser noted that teachers need to be able to, among other things, plan units, conference with students, assign journals, and take field trips. She highlighted the need for preservice teachers to begin to develop a repertoire for reform-minded teaching. Teachers need to peruse appropriate curricular and resource materials, explore successful teaching models, and develop a perspective of assessing for understanding, as required in reform-based teaching.

Foss & Kleinsasser (1996) stated that many early career teachers have misconceptions of what constitutes reform-based teaching. They may focus only on characteristics such as the use of manipulatives or small group work and fail to recognize the broader and basic premises of developing understanding and sense-making. In order to teach in a reform-based manner, early career teachers must understand how reform-based teaching differs from the traditional classrooms in which most 'apprenticed'. LaBerge and Sons (1999) suggested that, in order to develop this reform-based knowledge, preservice preparation needs to focus on the constructs of the NCTM Standards, constructivist practices, and how to choose curricular materials that support reform theories.

This preparation in standards-based practices must also extend beyond the methods classroom. Within the university program, stronger connections must exist

between the content, methods, and field-based experiences (LaBerge & Sons, 1999). This connection should then extend to include the schools where new teachers begin their inservice practice. In order for preservice teachers to develop an understanding of and belief in reform-based teachings, methods professors, clinical mentors, university supervisors, and student teaching cooperating teachers must all support and practice reform-based pedagogy (LaBerge & Sons, 1999).

For the purpose of this study, reform-based pedagogy was defined by the NCTM Process Standards (2000). Goldsmith and Mark (1999) supported this idea by relating that these processes should be a part of a classroom with a constructivist educational perspective. The five process standards include communication, connections, reasoning and representation. NCTM views these five categories as processes that all students should be able to use as they do mathematics. In the survey that supports this current research, the process standards were used as the organizational tool for Section 2 where respondents identified the reform-based practices that they use in their classrooms. Please refer to Table 2.1 for further clarification.

As indicated on Table 3.1, two survey questions, #11 and #17, directly related to developing a repertoire for teaching. On the table and in the survey, the wording ‘Developing an understanding of standards-based teaching strategies and skills’ was used.

Analyzing Beliefs and Forming New Visions

Ideas associated with beliefs were often similarly reflected by other researchers when discussing socialization. Feiman-Nemser’s (2001) views on the impact of beliefs on preservice teachers’ principles and ideas mirrored Lortie’s (1975) conclusions on socialization. Pajaras (1992) also supported Lortie’s views that preservice teachers’ K-12 experiences affected their beliefs about teaching. Pajaras reported that students entered methods programs with well established beliefs about teaching. Unlike university students in other fields, education majors often felt that they had little to learn in their methods courses. Based on their K-12 experiences, they often thought that they were ready to step into a classroom and teach. These students pictured themselves as the presenters of knowledge to a quiet, orderly classroom. These “taken-for-granted beliefs”

made it difficult for them to accept “new visions of reform-minded practice” (Feiman-Nemser, p. 1016).

Others (Fennema & Franke, 1992; Thompson, 1992) agreed that developing appropriate beliefs must be an essential component of a methods course if preservice teachers are to be successful. In order to support teachers in the use of reform-based practices, methods programs must first address their beliefs. Robinson & Adkins (2002) reported preservice teachers’ attitudes toward mathematics affected their students’ performance in mathematics. Initially preservice teachers’ own attitudes affected their ability to learn mathematics and this eventually affected their own students’ abilities to understand and use mathematics successfully. Therefore, by addressing beliefs as one component of a methods course, it may be assumed that future elementary students will directly benefit.

As a side, Richardson (1996) provided an excellent clarification on the similarities of ‘attitudes’ and ‘beliefs’. She described both as “a subset of a group of constructs that name, define, and describe the structure and content of mental states that are thoughts that drive a person’s actions” (p. 102). Pajares (1992) “suggested that such concepts as attitudes, values, preconceptions, theories, and images are beliefs in disguise” (p. 104). This researcher employed the similarities of these two definitions as a basis for using attitudes and beliefs interchangeably in this review of literature.

Reconceptualizing preservice teachers’ beliefs is a difficult task and, as such, must be directly addressed in methods courses. Roberts (2006) reported that the compilation of more content or pedagogical knowledge by preservice teachers will have little impact on their preconceived beliefs about teaching. Because beliefs do not change quickly, Hart (2001) suggested that ‘nurturing’ constructivist perspectives and reform-based ideas over time might prove successful in changing long-held ideas. Students’ beliefs may gradually change as they experience success in constructivist course activities or view reactions to reform-based teaching practices.

Many in math education believe that addressing beliefs must be a primary goal of elementary mathematics courses (Feiman-Nemser, 2001; Hart, 2001; Raymond, 1997). According to Raymond (1997), teacher education programs are often reported to have minimal impact on teaching practice. She suggested that, perhaps, by addressing beliefs,

teacher educators might have a “stronger indirect effect” (p. 572) and therefore have greater influence on teacher practice. In support of her choice to designate beliefs as one of the central tasks of preparation of preservice teachers, Feiman-Nemser (2001, p. 1017) concluded, “Unless teacher educators engage prospective teachers in a critical examination of their entering beliefs in light of compelling alternatives and help them develop powerful images of good teaching and strong professional commitments, these entering beliefs will continue to shape their ideas and practices”.

As indicated on Table 3.1, two survey questions, #12 and #18, directly related to developing a belief system concerning teaching. On the table and in the survey, the wording ‘Analyzing your beliefs and developing more positive ideas about standards-based teaching’ was used.

Developing the Tools to Study Teaching

The final task of Feiman-Nemser’s (2001) five tasks of preservice preparation is developing tools to study teaching. Central to this concept was developing the idea of the teacher as a continual learner. Feiman-Nemser stressed the importance of collegial conversation in this learning process. Her suggestions for encouraging this tradition in preservice teachers included “analyzing samples of student work, comparing different curricular materials, interviewing students to uncover their thinking, studying how different teachers work toward the same goals, and observing what impact their instruction has on students.” (p. 1019).

As indicated on Table 3.1, two survey questions, #13 and #19, directly related to developing oneself as a continual learner. On the table and in the survey, the wording ‘Developing the attitude of a life long learner’ was used.

Conclusions

Morris, whose reading audience was the Association of Mathematics Teacher Educators, spoke to the heart of the issue of preparing preservice teachers to teach mathematics.

But the nascent ideas cultivated in the methods class are fragile, and the dominant cultural script provides an ever-present and compelling counterargument. In the real world, society remains untroubled by declarations of innumeracy and math phobia. For many of the children, parents, and administrators with whom they'll work, innumeracy will be fashionable. Have we adequately prepared them for this reality? When we dare admit it, we know that even teachers we have personally prepared are not teaching in the ways we are advocating in our classes. They fall back on more traditional practices, and in so doing, replicate the status quo. (2006, p. 8)

What should we be teaching in elementary mathematics methods courses?

What content knowledge do early career teachers need in order to have the confidence to allow students to offer alternate solutions to problems? What do early career teachers need to understand about standards-based teaching in order to explain its tenets to administration, parents, and other teachers. What role do early career teacher's beliefs play in order for them to "maintain and strengthen their own resolve once they leave our classes" (Morris, 2006, p. 9)? Research has provided multiple viewpoints in answer to these questions. However, supporting the framework of symbolic interactionism, we need to hear more from the subjects themselves, methods course graduates/early career teachers. This current research will allow those most knowledgeable and affected by methods courses to share their perspectives.

CHAPTER 3 - Methodology

Overview

The literature cited in Chapter 2 demonstrates that early career teachers' knowledge and beliefs impact their mathematics teaching practices which in turn impact student learning. Suggestions for ways to improve preservice teachers' preparation for the challenges of the classroom vary widely, but missing in research is the early career teachers' own perspective on this issue. The purpose of this study was to offer early career teachers the opportunity to provide such information. A web-based survey provided early career teachers from across Kansas the opportunity to share their opinions about their own preparation programs, specifically their elementary mathematics methods courses. The data was used to determine what standards-based practices the early career teachers use in their own classrooms and what aspects of methods courses best prepared them and supported them in the use of these practices. The research also provided data that can be generalized to aid all who are concerned with the trend in early career teachers to use or revert back to traditional teaching practices.

The following questions guided this research including, but not limited to, the choice and actual wording of the survey questions:

1. What standards-based practices do early career elementary teachers report using in the teaching of mathematics?
2. What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?
3. What changes in their elementary mathematics methods course(s) do early career teachers feel would better prepare them to use standards-based practices in their classrooms?

Research Design

A web-based survey research methodology of mixed design was chosen for this study. Both qualitative and quantitative data collection and analysis practices were employed. The web-based design facilitated access to multiple perspectives held by early career teachers from across the state of Kansas. A web-based survey methodology fit well with the researcher's goals for multiple reasons. As noted by Jeroski, Booth and Dockendorf (1995), surveys are appropriate to use when the desired data includes "attitudes, experiences, opinions, beliefs, self-reported behaviors" (p. 17). This type of data directly suited the purpose of this research.

Web-based survey research also allows for the collection of data from a large number of participants spread across a large geographic area (Dillman, 2007). In the case of this survey, the large geographic area was the entire state of Kansas, approximately 8000 square miles. The use of the Web made accessing teachers in this large area possible. The results of the survey therefore included the opinions of a relatively broad population both in terms of geographic location and number.

In addition, the survey provided anonymity for the respondents, which encouraged truthfulness in responses. Closed and open response questions were included in the survey allowing not only for opinions, but also for explanation of responses.

Pilot Studies

Two pilots aided in developing this research. The first, analyzing another Axio survey, was not a true pilot, but so strongly impacted the development of this current research that explanation was required in this section. The second was a pilot of the survey instrument and served multiple purposes. First, the use of the pilot strengthened the validity of the instrument by gaining outsiders' input on the ease, or lack of it, of responding to this survey. Respondents also helped clarify wording and provided proofreading for mistakes. The pilot also was used to determine the time required to take the survey. This average time allowed the researcher to provide future respondents with an approximate time frame to allow for the survey,

Analyzing another Axio survey will be discussed first as it occurred first chronologically. Before beginning this research study, the researcher coded, organized, and analyzed data from a previous survey, Mentoring Across the Horizons: The Young and the Rest of Us (Y&R). The Y&R survey and analysis can be found in Appendix A. Funding for this survey was provided by grant #20070544 from the Ewing Marion Kauffman Foundation with funding notification received on January 12, 2007. The proposal for the grant was made by Dr. David Allen and Melisa J. Hancock on behalf of the Kansas Association of Teachers of Mathematics (KATM). The money was awarded to both KATM and to the Kansas Association of Teachers of Science (KATS). The survey was sent to Kansas Educators via Kansas State University's Axio Survey and was open from April 15, 2008 to May 15, 2008.

With the ultimate goal of dealing with teacher attrition, this grant project sought to facilitate mentoring for new mathematics teachers. The survey's primary focus was on current mentoring policies in Kansas and teacher opinions on the successes and failures of those mentoring programs. However, many other subjects were addressed including resources available to early career teachers in terms of administration support, technology, and professional development; career goals; concerns of early career teachers; and how early career and veteran teachers relate. To a great extent, the results of the Y&R survey informed the direction and format of the current study, based on both its successes and its failings.

First, the Y&R survey sought the opinions of early career teachers in Kansas as did this research. Second, the Y&R survey used Axio Survey and offered both open and closed response questions as did the current survey. Third, though the Y&R survey focused on mentoring, some of the support questions focused on topics relating to the current survey and teacher responses reflected feelings on related topics. Teachers commented on areas for which they felt adequately or inadequately prepared and commented on their mathematics methods experiences in relation to preparedness. Fourth, efforts were made to strengthen response rate on the current survey partially as a result to the low response rate on the Y&R survey.

As does the current research, early career teacher opinion was the focus of the Y&R research. As such, the survey questions asked for opinions and activities associated

with one's first few years of teaching. Many early career teachers provided noteworthy responses. However, because the survey also reached a number of veteran teachers, their responses reflected both confusion and frustration at their inability to provide valid responses. This researcher made every attempt to assure that only early career teachers received and responded to this current survey.

The participant list for the Y&R survey was obtained from the Kansas Department of Education. This list included Kansas educators who had self-selected to be included on a Kansas Department of Education database of electronic mail addresses. Because this list obviously included both early career and veteran teachers, this researcher used an alternate method to determine participant addresses, as described under Participants and Data Collection. The current survey also purposefully began with questions that directed only the early career teachers to complete the survey.

A second decision influencing the current survey was based on a strength of the Y&R survey format. The Y&R survey provided the opportunity for both open and closed responses. The participant responses were quite candid and honest and supporting examples were provided by participants. Because of the success of this survey format, the researcher provided opportunities for both open and closed responses and for additional comments on the current survey.

Some of the responses on the Y&R survey impacted the content of questions on the current survey. Of specific note were those Y&R comments concerning areas for which early career teachers felt prepared and/or unprepared to teach, the use of reform-based teaching strategies, and how university math methods courses prepared them for various teaching situations. Appendix A contains a detailed summary of this researcher's data analysis of the Y&R survey.

Two related Y&R questions which elicited responses that this researcher found particularly significant were, "How do veteran and early career teachers relate?" and "Are veteran teachers responsive to early career teachers?" About three-fourths of the teachers reported good relationships, but the remaining one-fourth reported relations were mixed – including both good and bad. Among these comments were items such as veteran teachers do not want to change, are set in their ways, won't listen to new research, aren't open to new ideas or that veteran teachers are "burned out." Early career

teachers reported a lack of interest on the part of veteran teachers in regard to reform-based research on mathematics pedagogy.

Roberts' (2006) research indicated that veteran teachers' reactions have a direct impact on novice teachers' use of standards-based practices. This question raised the issue of how methods courses might address the ideas of beliefs, reinforcing beliefs and defending those beliefs. Multiple researchers (Hart, 2001; Raymond, 1997; Roberts, 2006; Robinson & Adkins, 2002; Skott, 2001) also dealt with the influence of beliefs on practice and of a single methods course's possible impact on those beliefs. Consequently, this researcher's survey included questions on how beliefs might be best addressed in a methods course.

Responses to a second Y&R question also impacted questions developed for this current survey. The question "What are your top 3 concerns as an early career teacher?" elicited 323 responses. Embedded in these responses, 20 teachers requested assistance with lesson planning and classroom procedures. Another 40 sought information on assessments, No Child Left Behind, and testing in general. The need for more effective teaching strategies was listed by 18 teachers while 33 were concerned with their lack of understanding of the standards, the curriculum, or the math content that they were teaching. Twenty-eight were concerned that they were not teaching correctly or meeting the standards.

These teachers' desire to have adequate content knowledge and pedagogical content knowledge was obvious. Equally obvious was these teachers' understanding of the necessity of this knowledge. Historically, both content knowledge and pedagogical content knowledge are developed in methods courses. Hence, this researcher's survey questions elicited novice teacher input on how to best prepare them in content and pedagogical content knowledge.

Interspersed throughout all responses on the Y&R survey were references to methods/college courses. Some comments were positive, "I learned everything I know in methods." Some comments, however, were negative, such as "There should be more in methods." or "I didn't learn anything in methods about assessments, AYP, etc." Five reported that the methods of teaching that they learned in college were ineffective while 11 commented that they relied totally on what they learned in college. These pro and con

remarks precipitated the current survey's inclusion of opportunities to provide both positive and negative comments in regard to methods experiences.

Responses most closely aligned with the researcher's survey were in reply to the Y&R question, "What question/topic do you feel should have been addressed in this survey, but wasn't?" Two teachers wanted to be asked what new teachers really need. Two other teachers proposed that 'what universities could do differently to better prepare future teachers' be included. These four responses further guided this researcher to provide an opportunity to listen to new teachers, specifically concerning their preparation as teachers.

The fourth and final impact of the Y&R survey was based on its non-response issues. During the analysis of the Y&R survey, the researcher became aware of the large numbers of teachers who failed to respond to all or part of the survey or to complete the survey. On the survey's last question requesting a district name or number, only 7 of the 297 districts in Kansas had a response rate of ten or more teachers. Another 11 districts had two, three, or four respondents, and one teacher responded from each of an additional 34 districts. These responses represented only about one-sixth of the districts in Kansas. One factor impacting this response rate was the participant list which was, again, the Kansas Department of Education list to which educators self-selected to participate. It was assumed teachers from all districts were not represented in the original mailing list. For the current research, this researcher purposefully contacted every district in order to develop a contact list.

Further data from the Y&R survey indicated 552 teachers started the Y&R survey, but only 327, or 59%, responded to the final question. These figures indicated 225 teachers quit before completing the survey. Considering the aforementioned similarities of the Y&R and this researcher's survey, completion rates needed to be addressed. Supported by teacher comments on the survey, but not by specific data, it was assumed that some veteran teachers became frustrated with questions that did not apply to them on the Y&R survey and therefore did not complete the survey. If, by mistake, the current survey reached any veteran teachers, the cover letter and early questions directed them not to complete the survey.

Other tools were used to address nonresponse and noncompletion issues. First, a feature offered by Axio Survey sent automatic reminders to those who did not complete the survey. This researcher chose to send 2 reminder messages with 3 days between messages. A personal message reiterated the importance of the survey and this researcher's appreciation for the time required for completion.

To further address response rate, Dillman's (2007) ideas on the theory of social exchange, as it related to response rate, were applied to this survey. The three elements of social exchange are rewards, cost, and trust. Rewards apply to what the respondent will gain from completing the survey. Suggested rewards included showing positive regard for the respondent, explaining the importance of the survey, "we appreciate your help" and "thanks in advance" comments, asking for advice, or giving tangible rewards. Making the questionnaire interesting with good layout and design, placing more interesting questions near the first, and making questions easy to understand and answer also "reward" the participants. Dillman also suggested that follow up reminders let respondents know that they do not get many opportunities to respond and they may not get to respond unless they do it early. Rewards offered for completion of this survey included an initial explanation of the importance of the survey and an offer to send the final results to completers. The survey appealed for help to improve methods courses with information that only these respondents, recent graduates, could provide. A "thanks in advance" show of appreciation was provided.

The second portion of the theory of social change suggested the importance of cost (Dillman, 2007). In this situation, cost applied to what the respondent will give up or "spend" to participate in the survey. Dillman offered specific suggestions for reducing social costs. Each of these suggestions was followed by this researcher. The current survey did not use subordinating language nor ask questions that might have embarrassed or caused stress to the respondent. Explanations were offered when personal opinions were requested and anonymity was assured. An estimated time to complete the survey was offered and ease of response was addressed in the survey format by making the survey easy to manipulate and to complete.

The last component of the theory of social change is trust. "Trust is the expectation that in the long run the rewards will outweigh the costs." (Dillman, 2007, p.

18). Trust can be exemplified through “attention to detail that makes the questionnaire look and seem important” (Dillman, p. 18). For a mailed survey this could include the use of good paper and keeping the format neat and easily read. The Axio Survey format offered a very professional appearance while providing ease of use and completion. Trust was also invoked through indicating commonalities between the survey author and the respondents. A cover letter to all respondents addressed the author’s past classroom and methods teaching experience. The letter also related how the results would be used to inform and improve the preparation of future elementary mathematics teachers. Another method of establishing trust was to note sponsorship by legitimate authorities (Dillman). The author’s connections to two well respected Kansas universities, Kansas State University and Washburn University, was noted in the cover letter. This connection was meant to provide legitimacy especially since the survey was being sent to Kansas teachers.

Lastly, in response to a general question of what should be offered on the Y&R survey but was not, a few teachers offered opinions that impacted this current survey. Eight teachers felt that the survey was ‘too long/took too long’. In response, the current survey had limited open response questions and a format that required little time to comprehend. Five responses to the Y&R survey wanted to know how the information gathered was going to be used. A response to this question was included in the cover letter. Results will be shared with respondents and with other universities in Kansas. One responder to the Y&R survey offered the opinion that the Y&R survey should be used as a good starting point for gathering other data. This researcher agreed with that point of view in composing this current survey.

In conclusion, analyzing the Y&R survey benefited the researcher in many ways. She became more familiar with survey research in general and the need for addressing the response rate. She learned that wording that may appear clear to the survey designer may be easily misunderstood by the respondents. She saw the importance of clear guidelines concerning who is to complete the survey. She gained insights into the concerns of early career teachers and learned of conditions they feel work against them and of systems they feel support them in their classrooms and in their careers. Though the researcher did not

develop the questions for the Y&R survey, the lessons learned evaluating it proved very valuable in developing this current survey.

After the current survey was designed, a pilot was conducted. The pilot of the survey tool was utilized approximately two weeks before the final survey was opened to early career teachers. Proofreading, outsiders' ideas on ease of reading, and suggestions for overall improvement strengthened the validity of the final survey. The researcher also needed to know the average time needed to complete the survey as this fact was to be included in the beginning directions. The researcher's elementary math methods' students served as a pilot audience. These methods students were university juniors and seniors, majoring in elementary education. Methods students were used for two reasons. First, use of actual early career teachers would have decreased the pool of respondents for the actual survey. Second, the selected students were completing their mathematics methods block and therefore familiar with the terminology and concepts alluded to in the survey.

The pilot survey provided valuable experiences related to entering respondent Email addresses on to the AXIO survey system and for sending Emails to respondents prior to sending the survey. Methods students were encouraged to take the online survey and to fill out a response sheet (see Attachment B) which included comment sections for the survey and a few basic directions. Directions for completing the survey were limited to those provided on this worksheet because the researcher wanted the pilot responders to take the survey from the same uninformed perspective of future survey responders.

Eighteen methods students completed the pilot survey. No major changes, but multiple minor changes, were made, based on comments from the pilot survey responses. The initial email was made more welcoming based on six students' suggestions. Two sets of directions were clarified as a result of student confusion. Several typing, grammar and spelling errors also were corrected.

Methods students were required to answer all questions, including open-ended questions, so that their estimated completion time would more likely mimic that of future responders. As previously noted, Dillman (2007), indicated response rate for a survey can be enhanced by addressing *rewards*, *cost* and *trust*. Dillman provides several suggestions for reducing the respondents' *cost* associated with taking a survey, one of them being to make the survey appear short and easy. With this idea in mind, methods students were

required to record the length of time required to take the survey. Times for methods students to complete the survey ranged from 10-23 minutes, with a mean of 14 minutes. Based on this response, the directions for the actual survey indicated that “The survey should take around 15 minutes” and also indicated that respondents could “start and stop as needed.” Both of these comments were intended to lessen the *cost* factor therefore encouraging survey participation.

Survey Instrument

A web-based survey was chosen as the most effective data gathering tool for this research. Axio Survey was chosen as the research instrument. Axio Survey is a web-based survey creation tool which was developed by experts in the field of eLearning in the Survey Research Laboratory, Dept. of Sociology, Anthropology, and Social Work, Kansas State University in Manhattan, KS. All KSU instructors have access to it. Axio Survey has a dedicated secure web server and requires only access to an Internet browser in order to create, administer and respond to a survey.

Axio Survey was chosen for its availability, its ease of use and for its guarantee of anonymity for respondents. According to the Axio Survey FAQ (2009, p. 1) the tool ensures the “confidentiality of an individual’s responses.” When a respondent submits responses, no identifying information is linked to the response. The Axio system tracked who had completed the survey so email reminders could be sent to nonresponders. It should be noted that, since only select Axio Survey staff members, not participants or survey administrators, had access to identifying information, anonymity could be maintained during this process.

Axio Survey offered two distribution methods – open or E-mail. For open offerings, the administrator distributes the link, then anyone with access to the link can complete the survey. This researcher chose the second distribution method, E-mail. For E-mail offerings, on a set date, Axio Survey sent an E-mail to each recipient whose address was provided by the researcher. This E-mail included a link by which the recipient could access the survey. Axio Survey has designed the E-mail distribution method so that the survey can only be completed one time. Recipients had received a previous email (see Appendix D) explaining their involvement and details of the survey.

The survey appeared when the recipients clicked on the link. A Survey Description (see Appendix E) explained the purpose of the survey, the time required to participate, the researcher's email address in case of questions, and directions for receiving a copy of the survey results. The Informed Consent (see Appendix E) was also imbedded in the Survey Description. On the same page Opening Instructions (see Appendix E) provided directions for taking the survey. The five sections of the survey were described, 'standards-based practices' was defined, and the first two "required" questions were explained.

Axio Survey offers multiple options, many of which were used by the researcher. Survey questions may be marked as 'required' whereby respondents must respond before moving to the next question. This option was used on questions 1 & 2 as the answers to these two questions determined if the respondent was actually an early career K-6 teacher of mathematics. For all other questions, respondents were allowed to skip and return later to respond. An alert did serve as a reminder when a question was skipped, but did not prevent the respondent from continuing. Another option utilized was the progression bar. This appeared on each new page of the survey and helped respondents track their progress on the survey. It was hoped that the bar would encourage respondents to view their progress and, therefore, enhance the completion of the survey.

Another option of Axio Survey is the opportunity to send reminder messages to those respondents who have not completed the survey. Both the maximum number of reminders and the time intervals between reminders are choices. The researcher chose to send 2 reminders at 3 day intervals. The wording of the email reminder (see Appendix F) was also an option.

There were five sections in the survey. The first section contained two demographic questions, purposefully placed at the beginning of the survey. The two questions were necessary to help identify those teachers who are early career teachers of mathematics. The first question asked the number of years that the teacher had taught with directions to not complete the survey if the number was 4 or more. The second question asked if the teacher was currently teaching mathematics in some capacity to students in grades K-6. Teachers not meeting the criteria of these first two questions were thanked for their time and asked to *not* complete the rest of the survey

The second section's questions allowed the early career teachers to describe the standards-based practices that he/she felt he/she used in the classroom. This section corresponded to Research Question #1, 'What standards-based practices do early career elementary teachers report using in the teaching of mathematics?' These practices were based on NCTM's process standards of connections, communication, reasoning, problem solving and representation as are described in greater detail in chapter 2. Respondents indicated the frequency with which they use teaching strategies associated with each process standard.

The third section corresponded to Research Question #2, 'What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?' Respondents indicated the degree to which various pedagogical strategies from his or her methods course prepared them for the classroom. Respondents also were allowed a choice, stating that a particular strategy was not used in their methods course. These strategies were organized into Feiman-Nemser's (2001) Central Tasks of Preservice Preparation which was fully explained in Chapter 2.

The fourth section corresponded to Research Question #3, 'What changes in their elementary mathematics methods course(s) do early career teachers feel would better prepare them to use standards-based practices in their classrooms?' The early career teachers were asked to rank teaching strategies that, when used in a methods course, would have better prepared them for the challenges that they are facing in using standards-based practices. These strategies, as in the third section, were organized into Feiman-Nemser's (2001) five Central Tasks of Preservice Preparation.

The fifth and final section contained three questions. Respondents were first asked to respond to the degree to which their elementary math methods course focused on the NCTM standards. The last two questions asked for the grade level and primary teaching responsibility of the respondent. The survey concluded with a final thank you to respondents and the researcher's email address by which questions could be answered or results of the survey could be requested.

To aid reader understanding, the following table (see Table 3.1) matches the three research questions to the corresponding survey sections, question numbers, and Axio

Survey categorized question types. Section II questions were designated “Scale” as respondents were to rate frequency of use according to a provided scale of ‘Never’ to ‘Nearly Always’. Section III questions were also designated as “Scale” as respondents indicated how beneficial aspects of methods were according to a scale of ‘Not Beneficial’ to ‘Very Beneficial’. Section IV included “Ranking” questions as respondents were to order teaching strategies in relation to the degree the stated strategy could improve a methods course.

Sections II, III, and IV each also included one open-ended question, designated by Axio Survey as a “Short Answer” question. The content of each open-ended question matched to the associated research question for that section of the survey. Also included on Table 3.1 are the organizational tools around which Sections I, II, and III were designed and Y & R Survey responses which, in some way, prompted the research questions. Sections I & V are not included in this table as they were made up of demographic multiple choice questions which were not directly related to a research question.

Table 3.1 Research Questions Matched to Survey Questions and Pilot Study

Research questions	Survey Sections, Question #'s and Type	Research base & organizational tools	Pilot study prompts
1. What standards-based practices do early career elementary teachers report using in the teaching of mathematics?	Section II - Questions: 3 scale 4 scale 5 scale 6 scale 7 scale 8 short answer	NCTM Process Standards 1. Communication 2. Connections 3. Reasoning 4. Representation 5. Problem solving	
2. What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?	Section III - Questions: 9 scale 10 scale 11 scale 12 scale 13 scale 14 short answer	Tasks of Preservice Preparation 1. Subject matter knowledge 2. Learners & learning 3. Strategies 4. Beliefs 5. Life-long learner	Responses on Y&R questions: 5, 11, 12, 14, 15, 16 & especially 20 & 22.
3. What changes in their elementary mathematics methods course(s) do early career teachers feel would better prepare them to use standards-based practices in their classrooms?	Section IV - Questions: 15 ranking 16 ranking 17 ranking 18 ranking 19 ranking 20 short answer	Tasks of Preservice Preparation 1. Subject matter knowledge 2. Learners & learning 3. Strategies 4. Beliefs 5. Life-long learner	Responses on Y&R questions: 5, 11, 12, 14, 15, 16 & especially 20 & 22.

According to Dillman (2007), survey questions fall into three categories: open ended, closed-ended with ordered response, and closed-ended with unordered response. All three of these types of questions were used in the survey. Open-ended questions have no answer provided. On Axio Survey these questions were designated as Short Answer. Responses to open ended questions on the Y&R survey offered some of its most useful information and this researcher chose to offer the same opportunity on the current survey.

Dillman's (2007) closed-ended responses with ordered responses were used in Sections I and V for the demographic questions and in Sections 2 and 3 for the Scaled questions. Respondents chose from a provided list of options. Following suggestions

made by Dillman (2007), an even number of responses were offered and numerical values were attached to the word descriptions (i.e. “rarely” followed by “1 of 5 lessons”).

Section IV questions are classified as closed-ended response with unordered options (Dillman, 2007). These questions involved a list from which respondents chose rankings of 1st, 2nd, or 3rd. Though Dillman stated that unordered response questions may require more “effort to comprehend and decide how to answer” (p. 46) and may also be more difficult to analyze, he also noted that they often provide the most useful information.

Decisions for the overall design of the survey and for the composing, ordering, and grouping of the survey’s questions were based on frameworks by Dillman (2007) and by Krathwohl (1998). The goals in applying these suggestions were two fold - achieving a good response rate and guaranteeing accuracy of responses.

Propositions for increasing the response rate included beginning with a motivational welcome page, making early questions easy to answer, and including clear, specific instructions for each new question format. As explained in the previous section, Dillman’s ideas of rewards, cost, and trust also were considered. Multiple attempts to contact the respondents were made, based on Dillman’s findings that this is the most effective way to improve response rate (2007). For this research, district contacts received an initial explanation via phone or email (see Appendix C). Respondents received an email prior to receiving the survey (see Appendix D), a cover letter (see Appendix E) further explaining the importance of the survey and email reminders were sent (see Appendix F) for those not completing the survey in a given number of days.

In order to support accuracy of responses, other suggestions from Krathwohl and Dillman were employed. Questions were worded with as few words as possible and simple words were chosen over specialized words. Technical accuracy such as complete sentences, correct spelling and proper vocabulary were used. Anonymity was promised to encourage honest response. Vague questions, especially those including qualifiers such as regularly or occasionally were avoided. All answers to one question were displayed on the same screen and clear directions were stated for each question format. The overall goal was that all respondents interpret each question in the same way and feel

comfortable in making an honest response. Based on the quality of the responses received, this goal was achieved.

Setting/Participants

The population from which survey participants were drawn was that of early career teachers in the state of Kansas. For the purpose of this research, early career teachers were defined as teachers who had taught 3 or fewer years (Veenman, 1984). The population was also narrowed to only those early career teachers who were teaching mathematics in kindergarten through sixth grade.

Many steps were necessary in order to develop an initial list of early career, K-6 mathematics teachers in Kansas. A list obtained from the Kansas Department of Education contained email addresses of curriculum coordinators from the majority of Kansas's 297 school districts. It was assumed that curriculum coordinators, with their vested interest in teachers and teaching strategies, were a reliable resource for determining the early career teachers in their respective districts. The 2008-2009 Kansas Educational Directory was used to determine contacts for the additional districts. Some research and a number of corrections resulted in a list of contacts for the 250 districts on the original KSDE list and another list of contacts for the 47 districts not on the original KSDE list.

At this point, districts were contacted in one of two ways, by phone or by email. This researcher chose to phone the 45 districts with 5 or more elementary schools. In the larger districts it proved much more difficult to determine the appropriate person to provide the information needed and also to gain permission to receive the names and addresses of the early career teachers. Multiple phone calls, email messages and, in some cases, letters and the completion of forms, were required to gain the needed information in the majority of these 45 districts. The remaining 252 districts were contacted via email (see Appendix C). This email explained the purpose of the research and requested the email addresses of early career mathematics teachers in the district. Follow up phone calls and emails were required for many of these districts also. The final list of 1124 early career teachers became the initial population to whom the Axio survey was sent.

Of the initial group of 1124 teachers to whom the survey was opened, 134 completed the survey. This group of 134 respondents was narrowed to 97 who, based on responses to questions 1 & 2, identified themselves as early career (had taught 1, 2 or 3 years) K-6 teachers of mathematics. The final sample then represented mathematics teachers who were prepared in various colleges or universities (based on the variety of responses to question 21 and on open-ended responses). The final sample of teachers worked in a wide variety of teaching situations (based on responses to question 22) and represented all grade levels, kindergarten through sixth grade (based on the responses to question 23).

Data Collection

Dillman (2007, p. 13) states “the most dominant finding from research on how to improve response to self-administered surveys: multiple attempts to contact potential respondent are essential.” Because improved response rate was an initial goal for this researcher, multiple techniques were applied. As explained under Settings/Participants, explanatory emails (see Appendix C) or phone calls were used to contact the appropriate 297 district contacts. Another email (see Appendix D) was sent to the initial list of early career teachers two or three days before the survey. This email explained the purpose of the study and detailed dates that the survey would be activated and available. A basic description of the survey and opening directions were offered on the first page of the survey (see Appendix E) and a consent form (see Appendix E) was included with the survey. Finally, an Axio Survey tool allowing the sending of automatic Email reminders (see Appendix F) was used. These reminders were sent every 3 days to those who did not initially respond. A maximum of 2 reminders were sent.

In order to gain a maximum number of respondents, the choice of activation dates and the number of activations were purposeful. The initial surveys were activated in early May in order to avoid state testing dates (often in April) and the last week of school (late May). The researcher also wanted first year teachers to have experienced, as nearly as possible, a full year of teaching. The Axio survey was opened (sent) four times, not including the pilot offerings. The following table (see Table 3.2) indicates response rates and activation and deactivation dates. The first two offerings allowed a total of 9 days for

response, three weekend days and six school days. The third offering allowed only 6 days because it was opened late, but used the same deactivation date. The last offering was to a large, urban school district from whom late permission to send the survey was received. These teachers also were allowed weekend days and school days to respond.

Table 3.2 Survey Dates and Response Rates

Offering Name	Open Date	Close Date	Number Responding	Number Offered	Response Rate
Opinions on Elementary Math Methods	5/10/09	5/18/09	161	987	16.31%
Resend on Final Survey	5/10/09	5/18/09	4	13	30.77%
Resend on Final Survey 2	5/13/09	5/18/09	3	3	100%
Offering to District # X	5/16/09	5/20/09	15	134	11.19%
Totals*	N/A	N/A	183	1124*	16.28%*

*Totals are altered because the 2nd offering, Resend on Final Survey, was made to 13 teachers already included in the 987 count on the 1st offering, Opinions on Elementary Math Methods. Therefore the 13 (offered) are not re-included in the total of 1124. Further explanation and Completion Rate follow.

The survey was offered four times for various reasons. Immediately following the first sending, 13 emails bounced back as not delivered. Errors in email addresses for these 13 were immediately apparent so corrections were made to the addresses and the survey was reoffered to those 13 teachers. Three days after the initial offering, three teachers, not included in the initial list, emailed stating that they would like to take the survey. The survey was then opened to them. Six days after the initial offering, permission was finally received to send the survey to a large district's 134 early career teachers so the survey was opened for a fourth and last time.

Final numbers of teachers completing (not merely responding to) the survey are indicated in the table below. Teachers who responded to the survey (indicated in the Table 3.2) either completed it or quit before completing it. Included in the 'quit before

completing’ were those teachers who discovered after answering question 1 (years taught) or 2 (teaching math to grades K-6) that they did not fit the qualifications for the survey. As indicated in Table 3.3, 183 teachers responded to the survey, but 49 of those 183 did not complete the survey resulting in 134 respondents completing the entire survey.

Table 3.3 Number of Survey Completers

Offering name	Number responding	# Not Completing	# Completing
Opinions on Elementary Math Methods	161	46	115
Resend on Final Survey	4	0	4
Resend on Final Survey 2	3	0	3
Offering to District # X	15	3	12
Total	183	49	134 of 1124 completed = 11.29% completion rate

Data Analysis

Both qualitative and quantitative methods were employed in the analysis of data. Multiple methods were used on the closed response items to describe the data in quantitative terms. Predictive Analytics Software (PASW), formerly known as SPSS, Statistics GradPack 18 was used to determine frequency distribution, measures of central tendency, and measures of variability on Sections I and V (questions 1, 2, 21, 22 and 23) in order to determine demographic information. PASW was also used for all descriptive statistics for Sections II, III, and IV. The data from Section II (questions 3-8) was used to answer Research Question 1; Section III (questions 9-14) responses were used to answer Research Question 2; and Section IV (questions 15-20) answers related to Research Question 3. Internal consistency for the set of questions in Section II was determined using Cronbach’s alpha test for reliability.

Questions 8, 14, 20 and 24 were open-ended questions. The responses for these

questions were analyzed separately using qualitative methodology then results were compared to draw conclusions. General methodology is described here then specifics of categories, trends, quotations and final categories for each question are more specifically explained in Chapter 4. For each question, all responses were first read in order to gain a general sense of the data and to develop a basic plan. The researcher then coded the data, an inductive reasoning process that allowed the researcher to determine commonalities and trends in responses. The researcher looked for recurring patterns, repetitive responses, and main points in order to develop a set of categories in which to classify the responses for each question. Quotations of note, views outside of the norm, and counter examples were recorded. When possible the respondent's own language was used in response to Blumer's (1969) views on symbolic interactionism as it relates to research techniques.

In the first of these coding processes, open coding, initial categories of data were developed (Straus & Corbin, 1990). Open survey responses were placed in preliminary groups. Categorizing continued with a process known as the constant comparative approach (Straus & Corbin). The researcher continually questioned the data and made comparisons to previous information allowing data to be further organized into more specific categories. Miles and Huberman (1994) call this process "lumping and clumping." Categories were considered fluid as the researcher compared and contrasted data already categorized with new data. Memos were kept throughout the coding process as documentation.

Using the constant comparison methodology, the researcher recorded data which fell into more than one category or data that did not fit in any set group and reorganized categories and determined subcategories as necessary. The researcher continually memoed thoughts, hunches, and needs for further analysis. The constant comparison methodology allowed patterns to emerge as the data was analyzed. Final categories were determined depending on the number needed to reflect all perspectives.

When categories were delineated, the researcher used axial coding, a process that Creswell (1998, p. 151) defines as "exploring the interrelationship of categories" found in open coding. Interconnectedness and relationships between the closed-response and open-response questions relating to each of the three research questions and between the

various categories (survey sections) were determined.

In the final coding process, selective coding, the researcher sought connections between various parts of the survey. Creswell (1998, p. 151) calls this the “building a story” stage, where theoretical propositions were formed. In Chapter 5, the researcher offers theories concerning connections between methods practices which benefited new teachers, from survey Section II, and ideas for changing methods courses, from survey Section III.

Trustworthiness

The survey data was analyzed using both qualitative and quantitative research techniques. From the qualitative standpoint, it was assessed for trustworthiness based on criteria set forth by Lincoln and Guba (1985). According to Lincoln and Guba, in a naturalistic setting (qualitative research) trustworthiness is assessed based on the criteria of credibility or truth value, transferability or applicability, dependability or consistency, and confirmability or neutrality. In a quantitative sense, associated terms are internal validity, external validity, reliability and objectivity. Each is further defined below with examples of how the researcher ensured each.

Credibility/Internal Validity

An early sample offering of the survey, triangulation, and respondent anonymity support the credibility and internal validity of this research. The early sample offering of the actual survey strengthened the validity of the survey tool itself. Multiple methods students, with no specific directions, were able to correctly complete the survey. Changes to the survey, based on their input on minor issues, strengthened the actual survey.

The researcher’s doctoral committee also previewed and commented on the survey. The committee’s comments served to enhance credibility by examining the survey questions in relation to the research questions. Major changes in Section III resulted in stronger research on the intended question.

Multiple decisions about the content and circulation of this survey were grounded in the researcher’s analysis of a previous, somewhat similar, survey. The strengths and weaknesses of the Y&R survey enabled this researcher to avoid many pitfalls normally associated with a novice researcher’s first major survey. Through analyzing the Y&R

survey, much was learned about creating survey questions, determining an appropriate population, and analyzing responses.

Triangulation also strengthened the truth value or credibility of this research. As noted in Table 3.1, each research question was addressed with survey questions that were both open and closed therefore allowing respondents to answer similar questions in two formats. Both qualitative and quantitative methodologies were used to evaluate the data. Multiple assessment lenses allowed the data to be viewed from different perspectives. These multiple perspectives of the results support the credibility of the conclusions drawn.

Anonymity of responders further supported the credibility of this research. The Axio Survey tool ensured confidentiality because, though a few Axio Survey staff members had access to the data, administrators and participants did not. Honesty of responses was essential so the researcher needed to guarantee respondent privacy. The researcher wanted to assure that no repercussions would occur based on survey comments concerning respondents' school districts or methods courses.

Transferability/External Validity

Many aspects of this research supported its transferability or applicability, which is associated with external validity. The respondents represented a broad spectrum of early career teachers. The teachers represented 1st, 2nd, and 3rd year teachers who taught in a wide variety of situations. Their teaching positions ranged from kindergarten through 6th grade rooms. Their primary area of responsibility ranged from self-contained classroom teachers to departmentalized teacher to special education/resource room teachers. Some taught in small schools while others were from large schools. This wide continuum of teachers naturally corresponded to students who represented a broad spectrum of learners. This range of factors allowed for comparability with other early career teachers. Supporting the transferability of this research was the fact that the teachers were prepared in methods courses from multiple education programs and universities. Results were therefore generalizable to other populations of early career teachers.

Rich detailed descriptions of the responses added to the transferability of the data conclusions. Comprehensive examples and exact quotes from respondents aided one's

ability to judge the results on the basis of similarities to other populations of early career teachers or methods students.

Dependability/Reliability

Dependability or consistency, which is associated with reliability in quantitative research, was supported by a high reliability coefficients (.958) using Cronbach's alpha test for reliability on Section III of the survey, memoing while coding, and by triangulation. According to Lincoln and Guba (1985) dependability allows others to determine if the "application of similar data tools and analysis [would] yield similar outcomes?" In order to duplicate this research, another researcher would need detailed information describing the current study.

The researcher's committee chair constantly examined survey results and how results were compiled. By keeping this audit trail, results were examined for both accuracy and for justification of methodology. This researcher's memoing during coding also supported choices and decisions made. Memos aided in checking to discern if the integrity of the original information was retained.

Triangulation of source of data and methodology also aid in dependability. As explained under credibility, the survey allowed for both open and closed responses and both qualitative and quantitative methodologies were applied when analyzing the data.

Confirmability

Confirmability or neutrality assures that the researcher did not, during any part of the research, impact the outcome of that research. Also known as objectivity when associated with quantitative research (Lincoln & Guba, 1985), various techniques supported confirmability. This researcher incorporated an audit trail and triangulation to accomplish this goal. Committee cochairs' opinions were continually obtained throughout the planning and completion of this research. This input from others supported the objectivity of decisions made.

The incorporation of triangulation of sources and methodology corroborates the impartiality of the results. Multiple perspectives lent neutrality to both judgments and conclusions. This researcher's journal of conversations with committee members, comments on chapter drafts, and meeting schedules further supports confirmability.

Summary

Based on valuable lessons learned by analyzing the Y&R survey, this researcher developed, dispersed and analyzed a survey based on the following three research questions:

1. What standards-based practices do early career elementary teachers report using in the teaching of mathematics?
2. What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?
3. What changes in their elementary mathematics methods course(s) do early career teachers feel would better prepare them to use standards-based practices in their classrooms?

A list of contact persons for each of Kansas's 297 districts was compiled. Considerable time and effort was then required to contact each district, compile a list of over 1100 early career teachers of mathematics and gain permission to send the survey to these teachers. The survey was developed using Kansas State University's Axio Survey system and included both open and closed response questions. 134 teachers completed the survey with 97 of those teachers meeting the research qualifications.

Responses were analyzed using both quantitative and qualitative methodologies. Coding allowed this researcher to determine connections between respondent comments on past methods courses and suggestions for current methods courses. Positive comments on methods courses and suggestions for improvement were noted.

CHAPTER 4 - Results

Introduction

In order to answer the research questions, quantitative and qualitative data were gathered with the use of both closed-response and open-response questions on the survey. The analysis in this chapter is divided into five parts. The first part examines the demographics of the survey respondents. The second part examines the results of survey Section II, the open and closed questions relating to Research Question #1. The third part examines the results of Section III, the open and closed questions relating to Research Question #2. Section IV of the survey is examined in the last of the analyses and answers Research Question #3.

Demographics of Respondents

As is indicated in Table 3.3, 134 teachers completed the survey. By reviewing responses it was determined that, of this 134, 35 respondents actually answered Question #1 (number of years taught) as '4 or more' and 2 additional respondents answered Questions #2 (teach math to grade K-6) as 'No.' These 37 (35 + 2) respondents were not included in analyzed data results since they did not meet the requirements of early career K-6 teachers of mathematics. Predictive Analytics Software (PASW), formerly known as SPSS, Statistics GradPack 18 was used in analyzing all data and, in this case, to separate and analyze data of only the remaining 97 (134-37) teachers.

Survey questions 1,2, 21, 22, and 23 requested demographic information as indicated in Table 4.1.

Table 4.1 Demographic Questions and Response Options

Survey Question	Question wording	Response options
#1	How many years (including this year) have you been teaching (in any position at any level)?	1, 2, 3, 4 or more years

#2	Are you currently teaching mathematics in some form (for example as a classroom teacher, a resource room teacher, a special education teacher, etc.) to students in any grade K-6?	Yes or No
#21	The NCTM Process Standards are those things that all students should be able to do as they do mathematics. The standards are communication, connections, reasoning, representations, and problem solving.	The NCTM Process Standards were a (Central focus, Partial focus, Minor focus, No focus) in my elementary math methods course(s).
#22	Please check your primary area of responsibility as a teacher for this year. If your time was split, mark as many choices as are necessary.	Classroom teacher – mainly self contained; Classroom teachers – departmentalized; Interrelated, special education, resource room; Specialist, Title; Other
#23	Please mark the grade level for which you are most responsible. If your time is split or you work with multiple grade levels, mark as many as are necessary.	Kindergarten; First grade; Second grade; Third grade; Fourth grade; Fifth grade; Sixth grade; Other

Survey Questions 1 and 2

Frequencies and percentages of survey questions 1 and 2 were calculated to determine distribution according to number of years taught. All respondents for this group of 97 teachers chose the same response of ‘yes’ to question 2 indicating they taught mathematics in grades K-6.

Table 4.2 Number of Years in Teaching

Years in Teaching	Frequency	Percentage
1 year	34	35.0%
2 years	32	32.9%
3 years	31	31.9%

Of the 97 teachers included in the analyzed data, the number of first, second and third year teachers was fairly evenly distributed with 34 (35%) being in their first year of teaching, 32 (32.9%) completing their second year and 31 (31.9%) in their third year. The mean years of teaching for respondents in this survey was 1.96 years.

Survey Question 21

Frequencies and percentages for survey question 21 were calculated to determine

distributions and the degree for which respondents' methods course(s) focused on the NCTM Process Standards.

Table 4.3 Focus of Methods Course(s) on NCTM Process Standards

Degree of Focus	Frequency	Percentage
Central focus	58	60.4%
Partial focus	29	30.2%
Minor focus	8	8.3%
No focus	1	1%
	96*	100%

*One of 97 did not respond to this question.

For the purpose of this study, a standards-based methods course was defined as focusing on the NCTM Process Standards of communication, connections, reasoning, representations, and problem solving. Of the 96 teachers responding to this question, nearly 90% indicated the NCTM Process Standards were either a central (60.4%) or partial (30.2%) focus of their method course(s). Nearly 10% reported the NCTM Process Standards were only a minor (8.3%) or no (1%) focus of their methods course. Using PASW, a score of 1 was used to designate a 'central focus', 2 for a 'partial focus', 3 for a 'minor focus', and 4 for 'no focus'. The mean focus was determined to be 1.5 indicating the majority of the respondents considered the process standards to be a partial to central focus of their methods course.

Survey Question 22

Frequencies and percentages for survey question 22 were calculated to determine respondents' primary area of teaching responsibility.

Table 4.4 Primary Area of Responsibility

Primary area of responsibility	Frequency	Percentage
Classroom teacher – self-contained	77	79.4%
Classroom teacher - departmentalized	12	12.4%
Interrelated, special education, resource room	6	6.2%
Specialist, Title	1	1.0%
Other	1	1.0%
	97	100%

The majority of respondents indicated they were self-contained classroom teachers (79.4%). Classroom teachers, whether self-contained or departmentalized, comprised 91.8 % of respondents with non-classroom teachers comprising 7.2%. The six teachers choosing interrelated, special education or resource room teach math in a primary or supporting role. Only one teacher considered himself/herself to be a math specialist. One teacher did not classify himself/herself in any of these categories.

Survey Question 23

Frequencies and percentages of survey question 23 were calculated to determine grade levels for which respondents were most responsible.

Table 4.5 Respondents' Teaching Grade Level

Teaching grade level	Frequency	Percentage
Kindergarten	17	13.7%
First	25	20.2%
Second	21	16.9%
Third	24	19.4%
Fourth	13	10.5%
Fifth	15	12.1%
Sixth	9	7.3%
	124	

Respondents were directed to mark one or more grade levels depending on the grade levels for which they were responsible. The total of 124 shows some teachers felt responsible for more than one grade level. A review of the PASW data charts indicates teachers specifying they taught more than one grade level were either special education teachers, self-contained or chose the ‘other’ category.

All grade levels are represented by respondents of this survey. The highest percentage of responsibilities were for grade 1 (20.2%) and grade 3 (19.4%). The lowest percentage of responsibilities were for grade 6 (7.3%) and grade 4 (10.5%). Slightly more than half (63) of the responses indicated responsibility for primary grade levels (K-2) and slightly less than half (61) of the responses indicated responsibility for intermediate to middle level (3-6) grade levels.

Survey Section II – Research Question 1

Section II included closed questions 3-7 and open-ended question 8. All 6 of these questions related to Research Question #1, “What standards-based practices do early career elementary teachers report using in the teaching of mathematics?” These practices were based on the NCTM process standards of connections, communication, reasoning, problem solving and representation as are described in greater detail in chapter 2.

Respondents indicated the frequency by which they used four unique teaching strategies associated with each of the five process standards. Frequencies, percentages, ranges, and means were used to describe multiple aspects of the data. First, each of the 20 individual teaching strategies was analyzed to determine how often each is used and which strategies are used most often by the early career teachers. The four unique teaching strategies used to describe each process standard are included in the tables below.

Respondents indicated extent of use in an average week with these point values:

1 - never used, 2 – rarely, 3 – occasionally, 4 – often, 5 – very often, 6 - nearly always

Table 4.6 Survey Question 3: Communication Strategies

Teaching strategy - Communication	Frequency	Percentage	Range	Mean
3.1 Students are encouraged to share/question mathematical ideas during whole class discussions.	1 – 0	0%	4 (2-6)	4.9175
	2 – 3	3.1%		
	3 – 5	5.2%		

	4 – 19	19.6%		
	5 – 40	41.2%		
	6 – 30	30.9%		
3.2 As students do activities, ‘math talk’ is encouraged between and among students.	1 - 0	0%	4 (2-6)	4.5979
	2 - 3	3.1%		
	3 - 16	16.5%		
	4 - 22	22.7%		
	5 - 32	33.0%		
	6 - 24	24.7%		
3.3 Students express mathematical ideas and thoughts in writing.	1 - 1	1.0%	5 (1-6)	3.4167
	2 - 22	22.7%		
	3 - 31	32.0%		
	4 - 25	25.8%		
	5 - 12	12.4%		
	6 - 5	5.2%		
3.4 Students communicate mathematical ideas symbolically via manipulatives, drawings, graphical representations, etc.	1 - 0	0%	4 (2-6)	5.0000
	2 - 1	1.0%		
	3 - 6	6.2%		
	4 - 22	22.7%		
	5 - 30	30.9%		
	6 - 37	38.1%		

One of the strategies, 3.3 was ‘never-used’ by one teacher and seldom used by 22 teachers. The mean of 3.4167 for Strategy 3.3 was the lowest of all means for any of the 20 teaching strategies. Strategy 3.4, in contrast, had the highest mean, 5, of any of the 20 teaching strategies. Strategy 3.1, with a mean of 4.9175 was third highest of all 20 strategies, indicating high usage of this communication strategy also. Strategy 3.3 was obviously the least used strategy in the communication section and Strategy 3.4 was the most used strategy in the communication section. All ranges were from 1-6 or 2-6 indicating that some teachers reported ‘nearly always’ use of all 20 strategies.

Table 4.7 Survey Question 4: Connection Strategies

Teaching strategy - Connections	Frequency	Percentage	Range	Mean
4.1 Connections of the math concepts to real life phenomena are explored.	1 – 0	0%	4 (2-6)	4.5670
	2 – 2	2.1%		
	3 – 12	12.4%		
	4 – 31	32.0%		
	5 – 33	34.0%		
	6 – 19	19.6%		
4.2 Connections of the math concepts to other classroom subjects are explored.	1 - 2	2.1%	5 (1-6)	3.9691
	2 - 11	11.3%		
	3 - 20	20.6%		
	4 - 29	29.9%		
	5 - 25	25.8%		
	6 - 10	10.3%		
4.3 Connections of the lesson’s math concepts to other math concepts are explored.	1 - 0	0%	4 (2-6)	4.7320
	2 - 1	1.0%		
	3 - 8	8.2%		
	4 - 28	28.9%		
	5 - 39	40.2%		
	6 - 21	21.6%		
4.4 Students are encouraged to explore and describe mathematical connections	1 - 1	1.0%	5 (1-6)	4.3814
	2 - 8	8.2%		
	3 - 10	10.3%		
	4 - 28	28.9%		
	5 - 34	35.1%		
	6 - 16	16.5%		

One of the strategies, 4.2, was ‘never-used’ by two teachers and seldom used by 11. ‘Connections to other classroom subjects’ had a mean of 3.9691 and was the lowest of all means for the Connections Standard. This mean also ranked Strategy 4.2 as the

second lowest in overall usage for all 20 strategies. Strategy 4.3, in contrast, had the highest mean, 4.7320, for the Connections Standard with over 60% of teachers reporting its use as 'very often' or 'nearly always.' All ranges were from 1-6 or 2-6 indicating some teachers reported 'nearly always' using each of the four connections strategies.

Table 4.8 Survey Question 5: Reasoning Strategies

Teaching strategy - Reasoning	Frequency	Percentage	Range	Mean
5.1 Students are required to justify and support solutions, opinions, etc.	1 - 0	0%	4 (2-6)	4.4583
	2 - 6	6.2%		
	3 - 16	16.5%		
	4 - 27	27.8%		
	5 - 22	22.7%		
	6- 25	25.8%		
5.2 Students are encouraged to generate multiple or alternative solutions to problems.	1 - 2	2.1%	5 (1-6)	4.1875
	2 - 11	11.3%		
	3 - 15	15.5%		
	4 - 23	23.7%		
	5 - 29	29.9%		
	6 - 16	16.5%		
5.3 Students are encouraged to question solutions, strategies, processes, etc.	1 - 2	2.1%	5 (1-6)	4.1771
	2 - 7	7.2%		
	3 - 21	21.6%		
	4 - 26	26.6%		
	5 - 22	22.7%		
	6 - 18	18.6%		
5.4 Students are encouraged to estimate and determine if their answers are reasonable.	1 - 0	0%	4 (2-6)	4.4688
	2 - 1	1.0%		
	3 - 18	18.6%		
	4 - 29	29.9%		
	5 - 31	32.0%		
	6- 17	17.5%		

Strategy 5.2 had the most ‘never used’ or ‘rarely used,’ but Strategy 5.3 had the lowest mean score of 4.1771. Strategies 5.1 and 5.4 ranked the highest for the Reasoning

Process standard with means that were nearly equal.

Table 4.9 Survey Question 6: Representation Strategies

Teaching strategy - Representation	Frequency	Percentage	Range	Mean
6.1 Various representations of math concepts are presented by the teacher.	1 – 0	0%	4 (2-6)	4.9479
	2 – 2	2.1%		
	3 – 5	5.2%		
	4 – 25	25.8%		
	5 – 28	28.9%		
	6 – 36	37.1%		
6.2 Students are encouraged to create and use various representations to explain math concepts.	1 - 0	0%	4 (2-6)	4.5567
	2 - 3	3.1%		
	3 - 11	11.3%		
	4 - 30	30.9%		
	5 - 35	36.1%		
	6 - 18	18.6%		
6.3 Students are encouraged to use various representations to solve problems.	1 - 1	1.0%	5 (1-6)	4.6082
	2 - 3	3.1%		
	3 - 7	7.2%		
	4 - 31	32.0%		
	5 - 35	36.1%		
	6 - 20	20.6%		
6.4 Students are encouraged to compare and contrast various representations of the same math concepts.	1 - 1	1.0%	5 (1-6)	3.9897
	2 - 11	11.3%		
	3 - 19	19.6%		
	4 - 33	34.0%		
	5 - 23	23.7%		
	6 - 10	10.3%		

The Representation Process standard included the teaching strategy that had the

third lowest usage of all 20 strategies with a mean of 3.9897 for Strategy 6.4. Teachers reported usage as once for ‘never’ and 11 for ‘rarely.’ Strategy 6.1 within the Representation Process Standard also had the second highest usage of all 20 teaching strategies with a mean of 4.9479, indicating high usage.

Table 4.10 Survey Question 7: Problem Solving Strategies

Teaching strategy – Problem Solving	Frequency	Percentage	Range	Mean
7.1 Understanding the concept (the whys, connections, appropriate representations, etc.) is the focus of the lesson.	1 – 0	0%	4 (2-6)	4.4535
	2 – 5	5.2%		
	3 - 15	15.5%		
	4 - 26	26.8%		
	5 - 33	34.0%		
	6 - 18	18.6%		
7.2 The teacher acts as a support and guide rather than a provider of the solution to the problem.	1 - 0	0%	4 (2-6)	4.7526
	2 - 1	1.0%		
	3 - 10	10.3%		
	4 - 29	29.9%		
	5 - 29	29.9%		
	6 - 28	28.9%		
7.3 Students are encouraged to use various strategies to solve problems.	1 - 0	0%	4 (2-6)	4.8763
	2 - 2	2.1%		
	3 - 7	7.2%		
	4 - 23	23.7%		
	5 - 34	35.1%		
	6 - 31	32.0%		
7.4 The lesson’s math concepts are learned in the context of problem solving (i.e. as students solve the real life problem, they learn the mathematical skills or concepts necessary to solve the problem.)	1 - 0	0%	4 (2-6)	4.3402
	2 - 6	6.2%		
	3 - 15	15.5%		
	4 - 31	32.0%		
	5 - 30	30.9%		
	6 - 15	15.5%		

Strategy 7.3 had the highest usage of the problem solving strategies with a mean of 4.8763. Sixty-seven percent of the teachers reported using this strategy ‘very often’ or ‘nearly always.’ With a mean of 4.3402, Strategy 7.4 was reported as having the lowest usage with no teachers reporting ‘never used’, but with six teachers reporting ‘rarely used.’

After computing individual means for each strategy on questions 3-7, the ranges and the means for the four strategies associated with each of the five process standards were averaged.

Table 4.11 Average Ranges and Means for Each Process Standard

Process standard	Range	Mean
Communication	3.50	4.4871
Connections	3.75	4.4124
Reasoning	4.25	4.3229
Representation	4.00	4.5223
Problem solving	3.50	4.6057

Reasoning strategies had the widest average range, 4.25, of responses and the lowest average mean, 4.3229. Problem solving strategies tied for the lowest average range, 3.5, of responses and was used the most often with an average mean of 4.6057. All means indicated an average use between ‘often’ and ‘very often.’

Open-ended survey question #8 also related to Research Question 1 and stated “Please share any other comments that support or better explain your use of standards-based practices in your classroom.” There were a total of 22 responses, with some making multiple points. The responses were first read, then coded during a second and third reading in order to determine appropriate categories. Eight separate thoughts or ideas emerged. These qualitative statements triangulated the quantitative data from questions 3-7. Using Strauss & Corbin’s (1990) constant comparative approach these ideas were eventually organized into three main categories: 1. Reasons for not using standards-based strategies 2. Reasons standard-based strategies are used. 3. Other strategies used. Three responses were classified as not applicable to the question.

Category 1, Reasons for not using standards-based strategies, was further divided into: teaching issues, curriculum/supply issues and college preparation issues.

Early career teachers explained multiple reasons why they do not use standards-based teaching practices with “appropriate” teaching strategies being the most prevalent. Three of these teaching strategy comments related to capabilities of younger students. For example, “The younger kids seem to have enough to handle just grasping the basic concepts of adding and subtracting.” Or “Due to teaching Kindergarten some higher level processes, such as questioning solutions are not used as often...” Other responses were not aimed at a certain grade level, but indicated that some standards-based strategies were inappropriate because, “I am currently working on teaching the students math, the how and why will come later.”

Some early career teachers felt that curriculum or supply issues prevented them from using standards-based strategies. Three programs were specifically mentioned: Saxon Math’s lack of “room for deviation,” Investigations which “teaches the CONCEPT, but doesn’t connect to the standards language of mathematics,” and being a part of a FOCUS classroom which is “very functional math.” Support for manipulatives was mentioned, but one teacher stated, “It is tough when you are sharing the same manipulatives with several classes and/or grade levels.”

Lack of adequate college preparation was also identified as an issue hampering use of standards-based practices. Specifically mentioned was the need for methods classes to focus on what to “look for when choosing a math program” and on “teaching the state standards.”

Just as curriculum was noted for not supporting standards-based teaching, curriculum also received praise. Everyday Math received two positive comments with one teacher stating that it is “a great way to address all of these.” Other standards-based strategies were mentioned as receiving regular use. These strategies included finding a “variety of ways students can come to the answer,” “exploring problem and solution and making a connection for students with math to real life situations,” “group discussion with leading and redirecting questions,” and “hands-on activities and exploring how to think about a solution.”

Remaining applicable comments related to other teaching strategies used.

Respondents did not attempt to classify these as standards-based, but did mention them with a positive connotation. Ideas included giving homework each night, introducing common vocabulary, posting learning targets, and using students' names in word problems. Three non-applicable comments are not included here.

Survey Section III – Research Question 2

Section III included closed survey questions 9-13 and open-ended question 14. All six of these questions related to Research Questions #2, 'What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?' Respondents indicated the degree to which various pedagogical strategies from their methods course prepared them for the classroom. Respondents also were allowed to state if a particular strategy was 'not used' in their methods course. These strategies were organized into Feiman-Nemser's (2001) Central Tasks of Preservice Preparation which was fully explained in Chapter 2.

For this survey, Feiman-Nemser's Central Tasks of Preservice Preparation were renamed:

Task 1 (Survey questions 9): Developing an Understanding of Subject Matter
Knowledge for Teaching

Task 2 (Survey question 10): Developing an Understanding of Learners and
Learning

Task 3 (Survey question 11): Developing an Understanding of Standards-Based
Teaching Strategies and Skills

Task 4 (Survey question 12): Analyzing Your Beliefs and Developing More
Positive Ideas about Standards-Based Teaching

Task 5 (Survey question 13): Developing the Attitude of a Life Long Learner

For each of these five tasks, respondents indicated to what degree eight different aspects of their methods course benefited them in using standards-based practices in their classrooms. Degrees of benefit were indicated by:

1. It was part of my course, but it DID NOT BENEFIT me in developing my [wording from Task 1 or 2 or 3 or 4 or 5].
2. It was part of my course, but it WAS ONLY SOMEWHAT BENEFICIAL in

developing my [wording from Task 1 or 2 or 3 or 4 or 5].

3. It was part of my course and it was BENEFICIAL in developing my [wording from Task 1 or 2 or 3 or 4 or 5].

4. It was part of my course and it WAS VERY BENEFICIAL in developing my [wording from Task 1 or 2 or 3 or 4 or 5].

5. We DID NOT DO THIS in my methods course.

In the following table frequencies and valid percentages are indicated for each of the eight aspects in each of the five tasks.

Table 4.12 Frequency of Degree of Benefit for Aspects of Methods

Aspects of Methods Course	Degree of Benefit	Task 1 Freq.(%)	Task 2 Freq.(%)	Task 3 Freq.(%)	Task 4 Freq.(%)	Task 5 Freq.(%)
1. Presentations by the instructor with discussions and the opportunity for questions	1	3(3.3%)	3(3.2%)	3(3.2%)	4(4.3%)	4(4.3%)
	2	15(16.3%)	16(17.2%)	8(8.5%)	13(14.0%)	15(16.1%)
	3	35(38.0%)	31(33.3%)	37(39.4%)	35(37.6%)	29(31.2%)
	4	35(38.0%)	36(37.1%)	40(42.6%)	38(40.9%)	41(44.1%)
	5	4(4.3%)	7(7.5%)	6(6.4%)	0(0.0%)	4(4.3%)
2. Participating in activities (i.e. using manipulatives or playing games)	1	1(1.1%)	3(3.3%)	2(2.2%)	2(2.2%)	3(3.2%)
	2	6(6.5%)	7(7.6%)	9(9.8%)	9(9.8%)	10(10.8%)
	3	22(23.9%)	19(20.7%)	22(23.9%)	32(34.8%)	27(29.0%)
	4	57(62.0%)	55(59.8%)	53(57.6%)	44(47.8%)	46(49.5%)
	5	6(6.5%)	8(8.7%)	6(6.5%)	5(5.4%)	7(7.5%)
3. Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples	1	1(1.1%)	2(2.2%)	3(3.2%)	4(4.3%)	3(3.3%)
	2	14(15.2%)	12(13.0%)	20(21.5%)	14(15.2%)	18(19.6%)
	3	29(31.5%)	30(32.6%)	25(26.9%)	30(32.6%)	30(32.6%)
	4	20(21.7%)	23(25.0%)	19(20.4%)	22(23.9%)	19(20.7%)
	5	28(30.4%)	25(27.2%)	26(28.0%)	22(23.9%)	22(23.9%)
4. Teaching class-	1	4(4.3%)	6(6.5%)	2(2.2%)	3(3.3%)	4(4.3%)

mates OR Role playing OR Making presentations to the class (any or all of these)	2	13(14.1%)	12(12.9%)	16(17.2%)	13(14.1%)	12(12.9%)
	3	27(29.3%)	30(32.3%)	28(30.1%)	33(35.9%)	35(37.6%)
	4	40(43.5%)	40(43.0%)	41(44.1%)	37(40.2%)	38(40.9%)
	5	8(8.7%)	5(5.4%)	6(6.5%)	6(6.5%)	4(4.3%)
5. Reading and reflecting (i.e. the course text, journal articles, etc.)	1	9(9.8%)	9(9.7%)	10(10.6%)	9(9.8%)	7(7.5%)
	2	24(26.1%)	26(28.0%)	23(24.5%)	23(25.0%)	15(16.1%)
	3	39(42.4%)	32(34.4%)	32(34.0%)	37(40.2%)	37(39.8%)
	4	18(19.6%)	23(24.7%)	25(26.6%)	21(22.8%)	32(34.4%)
	5	2(2.2%)	3(3.2%)	4(4.3%)	2(2.2%)	2(2.2%)
6. Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)	1	2(2.2%)	5(5.4%)	3(3.2%)	3(3.2%)	4(4.4%)
	2	17(18.5%)	14(15.2%)	13(13.8%)	12(12.9%)	13(14.3%)
	3	32(34.8%)	36(39.1%)	37(39.4%)	39(41.9%)	36(39.6%)
	4	35(38.0%)	33(35.9%)	36(38.3%)	36(38.7%)	35(38.5%)
	5	6(6.5%)	4(4.3%)	5(5.3%)	3(3.2%)	3(3.3%)
7. Observing in actual classrooms OR Working with a single student (either or both of these)	1	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	2	2(2.2%)	1(1.1%)	3(3.2%)	1(1.1%)	1(1.1%)
	3	16(17.4%)	13(14.0%)	20(21.5%)	20(21.5%)	22(23.7%)
	4	66(71.7%)	67(72.0%)	58(62.4%)	62(66.7%)	61(65.6%)
	5	8(8.7%)	12(12.9%)	12(12.9%)	10(10.8%)	9(9.7%)
8. Planning and teaching lessons in actual classrooms	1	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	2	3(3.3%)	2(2.2%)	2(2.2%)	2(2.2%)	0(0.0%)
	3	12(13.0%)	8(8.6%)	15(16.1%)	19(20.4%)	20(21.5%)
	4	71(77.2%)	75(80.6%)	66(71.0%)	64(69.8%)	65(69.9%)
	5	6(6.5%)	8(8.6%)	10(10.8%)	8(8.6%)	8(8.6%)

Included percentages are Valid Percentages (adjusted in situations when the total number of respondents did not equal 97.) Line 5 on each Aspect of Methods Course

(shown in italics) indicates the percent of teachers who did *not* experience that teaching strategy in their methods course in relation to task 1, 2, 3, 4 or 5. Highest numbers in this category were the 28 teachers that did not experience case studies, videos, or work samples in relation to ‘understanding subject matter’, 25 teachers who did not experience this same aspect of methods in relation to ‘understanding learners or learning’, 26 who did not experience case studies, videos or work samples in relation to ‘understanding teaching strategies’, 22 who did not encounter any of the three to aid in ‘changing beliefs’, and 22 who did not experience them in ‘working to develop an attitude of a life long learner’. This would indicate that case studies, videos, or student work samples are used less often than the other methods teaching strategies.

The second least used strategy was ‘observing in classes/working with single students’. In relation to ‘understanding learners’ and ‘understanding teaching strategies’, 12 teachers in each category did not experience this strategy. Another 10 stated that this strategy was not used to help them change ‘beliefs’.

Aspect #7, ‘Observing in actual classrooms or working with individual students’ and aspect #8, ‘Planning and teaching in actual classrooms’ were considered to be the most beneficial aspects of methods in individual categories. Aspect #8 and #7, in that order, were identified as the most and next most beneficial for every category. Aspect #5 ‘Reading and reflecting’ had the most 1’s (did not benefit) and 2’s (only somewhat beneficial) in every methods course aspect. In contrast, ‘observing in actual classrooms’ or ‘planning and teaching actual lessons’ was never identified as ‘did not benefit’ for any aspect of a methods course.

To further compare methods practices early career teachers found to be beneficial, the data was analyzed by comparing rankings of means. When survey respondents initially chose the degree of benefit of each aspect, ‘Did not do this in my methods course.’ was an option. Using PASW this option was removed resulting in meaningful mean scores of choices with 1 assigned to ‘did not benefit,’ 2 assigned to ‘only somewhat beneficial, 3 to ‘beneficial’ and 4 to ‘very beneficial.’ In other words, higher means indicated respondents found that methods strategy’ to benefit them the most in using standards-based strategies in their classrooms. Table 4.13 indicates the ranking of these means for each of the Central Tasks of Preservice Preparation.

Table 4.13 Rankings of Percentages of Benefit from Aspects of Methods

Rankings of Means	Subject matter knowledge	Learning and learners	Teaching strategies	Beliefs about standards-based teaching	Becoming a life long learner
1st highest	8 Plan&teach	8 Plan&teach	8 Plan&teach	7 Observe	8 Plan & teach
2nd	7 Observe	7 Observe	7 Observe	8 Plan & teach	7 Observe
3rd	2 Participate	2 Participate	2 Participate	2 Participate	2 Participate
4th	4 Role play	4 Role play	1 Instructor	4 Role play	1 Instructor 4 Role play
5th	6 Curriculum	1 Instructor	4 Role play	6 Curriculum	1 Instructor 4 Role play
6th	1 Instructor	3 Videos	6 Curriculum	1 Instructor	6 Curriculum
7th	3 Videos	6 Curriculum	3 Videos	3 Videos	5 Reading
8th lowest	5 Reading	5 Reading	5 Reading	5 Reading	3 Videos

Two aspects within a cell indicate each aspect had equivalent means. ‘Planning and teaching a lesson for an actual class’ ranked first 4 out of 5 times and 2nd for the remaining aspect of methods. ‘Observing and/or working with a single student’ completed the other 1st and 2nd place rankings. ‘Participating in activities’ such as using manipulatives and playing games ranked third for each category. ‘Reading and reflecting’ ranked last in 4 categories and next to last in the fifth category. ‘Viewing videos, discussing case studies or analyzing work samples’ ranked last or next to the last for each category. Those aspects chosen as the least beneficial may have been so designated because they were not a part of the teachers’ methods course.

Finally, overall means for each aspect were determined by averaging the five means – one from each Central Task for Preservice Preparation. Table 4.14 indicates those means listed in order from highest to lowest.

Table 4.14 Ranked Aspects of Methods Course

Aspects of Math Methods Course	Means
Planning and teaching lessons in actual classrooms	3.7865
Observing in actual classrooms OR Working with a single student (either or both of these)	3.7367
Participating in activities (i.e. using manipulatives or playing games)	3.4397
Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)	3.2006
Presentations by the instructor with discussions and the opportunity for questions	3.1898
Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)	3.1583
Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples (any or all of these)	2.9826
Reading and reflecting (i.e. the course text, journal articles, etc.)	2.8212

As was determined from comparing these means, early career teachers reported ‘planning and teaching lessons in actual classrooms’ and ‘observing in actual classrooms, and/or working with individual students’ benefited them the most in their use of standards-based practices in their actual classrooms. As also was determined from the means, ‘reading and reflecting’ ranked last in the degree to which early career teachers indicated it benefited them. It should be noted, however, that, though ‘viewing videos’ and ‘reading and reflecting’ ranked the lowest of the eight choices, scores of 2.8212 and 2.9826 still categorized them as nearing the ‘beneficial’ classification.

Again using PASW, the reliability of this portion of the survey instrument was established using Cronbach’s Alpha test for reliability. By comparing the means of each subscale, Cronbach’s Alpha was determined to be .958 with an N of 40 items – five categories of eight items each.

Question number 14 asked respondents, ‘What aspects of your elementary methods course(s) had the greatest impact on your use of standards-based practices in

your classroom?’ Thirty-four teachers responded to this question, with many responses being multifaceted. As the data was analyzed two categories emerged, both well tied to the original survey question and triangulating the quantitative data from questions 9-13. Teachers responded with knowledge gained from their methods courses and with information they wished they had gained, but did not. Respondents did not tend to state if a particular aspect of their methods course helped them with a specific Feiman-Nemser’s (2001) Central Tasks of Preservice Preparation, though wording referencing teaching strategies (Task 3) were mentioned several times. The comments related directly to the eight standards-based practices upon which the survey questions were built. Table 4.15 has the number of comments relating either positively or negatively to each aspect and representative quotes from the actual responses.

Table 4.15 Research Question 2 – Open Ended Responses

Aspects of Methods Course	Number of Comments	Associated Comments Presented as Positive or Negative
1. Presentations by the instructor with discussions and the opportunity for questions	3 positive	“Discussions with the teacher about different ways to present concepts to kids,” “Listening to the teacher tell how students need math manipulatives,” “to have direct instruction followed by a chance to apply it”
2. Participating in activities (i.e. using manipulatives or playing games)	4 positive	“Actually doing the activities or using the manipulatives in different ways,” “The best thing for me was the instructor made us do the activities,” “I have a much deeper understanding of math since playing with the manipulatives.” “Being exposed to various strategies...For example, we used Hands On Equations in our class so when I went into my classroom I knew how to use the product and why it was important for my students.”
3. Viewing videos of teachers and students OR Discussing case studies OR Analyzing	1 positive	(Mentioned in conjunction with writing and teaching lessons) – “It was great getting to analyze the work

student work samples		that they (students) did.”
4. Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)	0 positive 1 negative	“I never got anything out of role playing with my peers; it was awkward and unreal.”
5. Reading and reflecting (i.e. the course text, journal articles, etc.)	0 positive 1 negative	“...majority of textbooks that I was required to purchase ... were of little help.”
6. Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)	2 positive 1 negative	“Looking at Kansas and national standards,” “Learning the standards ... and doing lessons to go with them,” “It would have been more beneficial to go over each standard and ways to teach to those standards.”
7. Observing in actual classrooms OR Working with a single student (either or both of these)	7 positive	(Five representative statements) “Any time I spent in classrooms helped me better understand standards-based practices,” “the greatest impact was every time we had the opportunity to see math in action,” “observe many teachers and see what strategies worked,” “It really helped me see what kind of teacher I wanted to be; what I wanted teaching to look like in my classroom,” “Being able to see how students behave, study, and learn first hand”
8. Planning and teaching lessons in actual classrooms	12 positive	(Four representative statements) “Planning and teaching actual lessons provided me with the greatest knowledge and background,” “Working with actual kids and experienced teachers,” “Working in the classroom with children in an authentic manner,” “Planning my own lessons – by looking at the standards and teaching it to a group of students.”

As with the closed-ended questions, comments on the open-ended section most often supported the methods practices of ‘observing in classrooms/working with individual students’ and ‘planning and teaching actual lessons’. Mimicking the results of the closed-ended questions (see Table 4.14), ‘participating in activities’ ranked third as an aspect of methods which supports standards-based teaching. ‘Presentations by the instructor with opportunities for discussion and questioning’ also received multiple positive comments and ‘examining curriculum materials’ was mentioned positively. ‘Reading and reflecting’, the lowest ranked practice from the closed ended questions (see Table 4.14), received only a negative comment in the open-ended section.

Four teachers explained the ineffectiveness of their methods courses. Justifications for these statements included poor instructors, the summer school set up of the course, and the lack of standards-based instruction. One respondent simply stated, “I didn’t learn anything in my math methods course.” Some early career teachers included suggestions to improve methods courses. These teachers wanted more instruction on connecting the curriculum to the standards, going over the standards and ways to teach to those standards, more ideas on teaching whole-group and centers, and learning more actual content.

Survey Section IV – Research Question 3

Section III included closed-response survey questions 15-19 and open-ended question 20. All six of these survey questions related to Research Question #3, ‘What changes in their elementary mathematics methods course(s) do early career teachers feel would better prepare them to use standards-based practices in their classrooms?’ The early career teachers were asked to rank strategies as 1st, 2nd, and 3rd that would most improve a methods course and which would have better prepared them for the challenges they face in using standards-based practices. These strategies were the same eight strategies used in Section III and these were again organized into Feiman-Nemser’s (2001) Central Tasks of Preservice Preparation.

In order for higher sums to represent stronger standings, PASW was used to reverse values before data was analyzed. In other words, a first place ranking, which was indicated by 1 on the survey, received a value of 3 and a third place ranking, which was indicated by 3 on the survey, received a value of 1. Second place rankings still received a

2. Table 4.16 indicates the ranked order of the eight aspects of a methods course. The ranking was determined by summing the 3s, 2s, and 1s assigned by the survey's early career teachers. Small numbers, 1-8, precede each shortened name of each teaching practice in Table 4.16. Use these numbers and refer to Table 4.15 in order to read the entire description of the eight teaching practices.

Table 4.16 Ranked Order of Beneficial Practices for Each Central Task

Order Determined by Sums of 1st, 2nd 3rd Place Rankings	Subject matter knowledge	Learning and learners	Teaching strategies	Beliefs about standards-based teaching	Becoming a life long learner
1st highest	7 Observe	7 Observe	6 Curriculum	7 Observe	7 Observe
2nd	8 Plan & teach	8 Plan & teach	7 Observe	8 Plan & teach 1 Instructor	1 Instructor
3rd	6 Curriculum	2 Participate	8 Plan & teach	1 Instructor 8 Plan & teach	8 Plan & teach
4th	2 Participate	1 Instructor 3 Videos	1 Instructor	6 Curriculum	5 Reading
5th	4 Role play	1 Instructor 3 Videos	2 Participate	5 Reading	2 Participate
6th	3 Videos	5 Reading	3 Videos	3 Videos	3 Videos
7th	1 Instructor 5 Reading	4 Role play	5 Reading	2 Participate	4 Role play
8th lowest	1 Instructor 5 Reading	6 Curriculum	4 Role play	4 Role play	6 Curriculum

Two aspects within a cell indicate two strategies received the same sum (tied) when rankings were added. Early career teachers indicated ‘observing and working with individual students’ would have improved their preparation in four of the five Central Tasks of Preservice Preparation. ‘Observing’ ranked second in the remaining category. ‘Planning and teaching actual lessons’ ranked second in three categories and third in the other two. ‘Role playing/teaching classmates/presenting to the class’ was indicated as the

lowest or next-to the-last ranked strategy. ‘Reading and reflecting’ and ‘examining curriculum materials’ sums twice placed each of them as the lowest ranking or next-to-the-lowest ranking for improving their preparation. ‘Videos/case studies/student work samples’ held middle to low rankings for each of the Central Tasks.

Following the first and second choices of ‘observing’ and ‘teaching’, ‘studying curriculum materials’ was chosen to best improve ‘subject matter knowledge’, ‘participation in activities’ was chosen to best help ‘understand learners and learning’, studying ‘curriculum materials’ was felt to help develop ‘teaching strategies’, and ‘presentations by the instructor with questions and discussion’ were selected for ‘developing beliefs’ and ‘becoming a life long learner.’

To further analyze this data, the total points for each of the eight aspects for all five Central Tasks were determined. Table 4.17 places the eight aspects in rank order according to these sums.

Table 4.17 Ranked Order of Practices to Improve Methods Courses (by Sums)

Ranking	Aspect of Methods Course	Sum
1st highest sum	Observing in actual classrooms OR Working with a single student (either or both of these)	706
2nd	Planning and teaching lessons in actual classrooms	547
3rd	Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)	329
4th	Presentations by the instructor with discussions and the opportunity for questions	320
5th	Participating in activities (i.e. using manipulatives or playing games)	301
6th	Reading and reflecting (i.e. the course text, journal articles, etc.)	236
7th	Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples	209
8th lowest sum	Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)	149

The sums for these aspects fell into clear categories. ‘Observing and working with a single student’ and ‘planning and teaching’ were the highest ranking strategies that

would most improve methods courses in preparing one to teach in a standards-based manner. ‘Observing’ had significantly more points than did ‘planning’. ‘Examining curriculum materials’, ‘presentations by the instructor’, and ‘participating in activities’ were closely grouped as the next three most effective strategies. ‘Reading and reflecting’ and ‘viewing videos’ could be grouped for sixth and seventh place and ‘teaching classmates’ had the lowest sum.

There were 22 responses to open-ended survey question #20, ‘To better prepare you to use standards-based practices in your classroom, what suggestions would you make to improve elementary math methods course(s)?’ There were 7 responses to survey question #24, ‘If you have final suggestions, questions or comments please share them here.’ As with open-ended questions #8 and #14 some responses had multiple facets. Because all responses to #24 were suggestions for improving elementary math methods these responses were analyzed along with those answers from #20.

All but 2 of the 29 comments (plus multiple facets of each response) from #20 and #24 related to suggestions for methods, whether it was aspects to add to/expand methods or aspects to remove from/decrease in methods courses. This data further triangulated the quantitative data from questions 15-19. Some respondents referred to facets of their past methods course while others simply stated aspects that would have improved their methods course. The comments, again, easily related to the eight aspects of a methods course which were used to categorize teaching strategies in survey questions 9-13 and survey questions 15-19. Table 4.18 includes the number of comments relating either positively or *negatively* to each aspect and representative quotes from the actual responses. Responses not corresponding directly to aspects 2-8, but relating to desired teaching strategies, were assigned to aspect 1.

Table 4.18 Research Question 3 – Open Ended Responses + Question 24

Aspects of Methods Course	Number of Comments	Associated Comments Presented as Positive or Negative
1. Presentations by the instructor with discussions and the opportunity for questions	6 positive	“give the students an idea of how to organize their own ... curriculum, and lessons when they are out on their own,” “we, as elementary educators should be more mathematically educated,” “do [more] on question[ing], assessment, grouping, and indicator teaching,” “need more work with ... differentiation within the actual classroom.”
2. Participating in activities (i.e. using manipulatives or playing games)	5 positive	“I loved the hands-on activities ... as long as there were handouts to accompany the activity,” “have a make it and take it ... [because] I don’t remember some of the math centers she [the professor] created.”
3. Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples	2 negative	<i>“this [the classroom] isn’t the cookie-cutter ... video set-up we had to watch over and over,”</i> <i>“video watching in methods courses were a waste of time”</i>
4. Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)	1 negative	<i>“role playing ... in methods courses were a waste of time”</i>
5. Reading and reflecting (i.e. the course text, journal articles, etc.)	2 negative	<i>“less basal work,” “Stop reading the book!”</i>
6. Examining curriculum materials (i.e. NCTM &	10 positive	“plan how you are going to teach through the curriculum while hitting on the standards that have

state standards, student texts, resource books)		to be met before state tests,” “Give more opportunities to become familiar with the standards,” “use the math curriculum presented by NCTM,” “categorize the activities according to standards,” “create standards-based folders ... collect different lessons for that particular standard,” “Expect units to be practical, and in depth on the indicator.”
7. Observing in actual classrooms OR Working with a single student (either or both of these)	6 positive	“Watch master teachers using standards-based practices and discuss why they’re effective,” “You learn more by observation,” “Get the students out in different school districts so they can observe different math programs,” “they need to be able ... to view teachers actually teaching curriculums and standards.”
8. Planning and teaching lessons in actual classrooms	10 positive	“More in-classroom practice,” “Practice, practice, practice,” “give as many field experiences as you can, and make them teach as many lessons as possible to actual students,” “Getting out there and doing it is key. Require your students to teach lesson to real kids,” “You learn more by observation and actually planning and conducting your own lessons.”

‘Examining curriculum materials’ and ‘planning and teaching lessons’ were the most suggested improvements for methods courses. In each of these categories, knowing the standards and planning lessons which focused on those standards were the most often mentioned needs. Multiple teachers also recommended ‘Observing’ a variety of curriculums in a number of classrooms and in different school districts. A number of requests focused on pedagogy. Early career teachers felt that methods courses should focus on organizing teaching ideas, differentiating instruction, and good questioning. One

teacher suggested stronger content preparation. Negative comments again were directed at role playing, viewing videos, and reading textbooks.

Summary

Three research questions framed the purpose of this study and the survey tool that was used to gather data. Responses to both open and closed survey questions successfully provided early career teachers' perspectives on their use of standards-based practices in the classroom and on aspects of elementary methods courses that support those practices. The tables and explanations in Chapter 4 provide a clear picture of methods practices that early career teachers feel to be beneficial and those that they deem to be of little value. The data also reflects the level at which early career teachers use standards-based practices in their mathematics classrooms. Based on conclusions drawn from these results, recommendations for the use of this data and for future research follow in Chapter 5.

CHAPTER 5 - Conclusions

Overview of the Study

Nearly any education-based discussion focuses on student achievement and it is widely accepted that effective teachers are a key component in achieving society's goals of well-educated children (Cochran-Smith & Zeichner, 2005; NCTM, 2000). Quality preparation of competent, qualified teachers naturally follows as a logical outcome of this discussion and, in the wake of those discussions, education preparation programs become the object of scrutiny.

Though no one questions the need for strengthening and improving our current preservice teachers' preparation programs, research both supports (Judson & Sawada, 2001; LaBerge & Sons, 1999; Robinson & Atkins, 2002; Valli, Rath, & Rennert-Aviev, 2001) and questions (Bramald, Hardman & Leat, 1995; Foss & Kleinsasser, 1996; Frykholm, 1996; Raymond, 1997) the benefits of current methods courses. Multiple NCTM documents (NCTM, 1989; NCTM, 1991; NCTM, 2000) support the value of strong mathematics methods courses while expressing reservations about existing preparation programs. Of special concern is the phenomena of early career teachers reverting back to teaching strategies with which they were taught in their K-12 education (Hart, 2001; Powell, 1992; Raymond, 1993) even when their methods course subject matter was consistent with the NCTM content standards and the pedagogy aligned with the NCTM process standards of problem solving, reasoning and proof, communication, connections and representation.

One explanation for this regression may lie with the multiple obstacles early career teachers face as they struggle to become the effective teachers needed in our schools today. Impediments, obvious to those in education, are student issues, low salaries, lack of planning time, less than satisfactory working conditions (Cavanagh, 2008) and high expectations of student achievement (Fennell, 2007). Less obvious to even those inside the field are the stresses associated with continual suggestions from misguided or uninformed parents, administrators, and/or veteran teachers. This "advice" can especially impede the use of standards-based practices in the teaching of mathematics

as others push the traditional pedagogical practices of their own past math experiences (Roberts, 2006).

Some early career teachers may even begin the year using more standards-based methods. However, depending on the strength of their beliefs and their commitment to standards-based teaching, these same teachers may revert to traditional pedagogy under the stress and pressures of the classroom (Roberts, 2006). Beliefs associated with standards-based teaching of mathematics during preservice education are not always powerful enough to withstand the scrutiny and criticism of others. Many novice teachers may only have the strength of their university program teachings to sustain their beliefs, and therefore the practice, of standards-based pedagogy.

Though theories vary when attempting to determine why early career teachers so often regress to traditional pedagogy, elementary mathematics methods courses must adjust to address the issue. Numerous studies exist on various aspects of elementary mathematics methods courses, but, lacking in research was early career teachers' opinions of their own methods courses and their recommendations for future methods courses. This survey research offered early career teachers an opportunity to explain their use of standards-based practices in their own classrooms and to share their opinions on methods courses.

With the goal of improving elementary mathematics methods courses the following research questions were developed.

1. What standards-based practices do early career elementary teachers report using in the teaching of mathematics?
2. What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?
3. What changes in their elementary mathematics methods course(s) do early career teachers feel would better prepare them to use standards-based practices in their classrooms?

Survey questions were designed to gain early career elementary teachers' perspectives on

these issues. The research was of mixed design using quantitative and qualitative analysis of survey data.

Demographics of Survey Respondents

The 97 survey respondents on whom the following data is based were early career elementary (K-6) teachers who were teaching math in some form. Early career teachers were defined as those having taught 1, 2 or 3 years (Veenman, 1984). Within this definition, the variations in experience were fairly evenly represented with 35% being first year teachers, 33% in their second year of teaching and the remaining 32% being third year teachers. Nearly 80% were self-contained classroom teachers, 12.4% were teaching in a departmentalized situation, and the remaining 8% represented interrelated, special education or resource room teachers, specialists or 'other'. Several teachers indicated teaching responsibilities at more than one grade level resulting in 124 responses in this category. Teachers choosing multiple grade responsibilities were either special education teachers, self-contained teachers or chose 'other'. All elementary grade levels, kindergarten through sixth grade, were represented by respondents of this survey. The highest percentage of teachers worked with first grade (20.2%) and third grade (19.4%). The lowest percentage of teachers taught grade 6 (7.3%) and grade 4 (10.5%). Slightly less than half of the responses, indicated responsibility for intermediate to middle grade (3rd – 6th) levels and slightly more than half of the responses denoted primary level (K-2nd) responsibility.

Respondents were to indicate the degree to which their elementary mathematics methods course(s) had a standards-based focus. Choices ranged from 1 for 'The NCTM Process Standards were a CENTRAL FOCUS of my elementary math methods course(s).' to 2 for 'The NCTM Process Standards were a PARTIAL FOCUS of my elementary math methods course(s).' to 3 for 'The NCTM Process Standards were a MINOR FOCUS of my elementary math methods course(s).' to 4 for 'The NCTM Process Standards had NO FOCUS in my elementary math methods course.' One teacher (1%) indicated no correspondence between his/her methods course and the NCTM Process Standards while 8.3% of the teachers felt that the Process Standards played only a 'minor' role in their methods course. Twenty-nine of the teachers (30.2%) placed the Process Standards as a 'partial focus' and the remaining 60.4% designated the Process

Standards to be a ‘central focus.’ A mean focus of 1.5 and the fact that over 90% of the respondents chose ‘partial’ or ‘central’ in relation to the standards indicated that most early career teachers have had significant exposure to the NCTM Process Standards during their elementary mathematics methods course(s).

Summary of Results Related to Research Questions

Question 1

Six survey questions, five closed and one open, provided data for Research Question 1 ‘What standards-based practices do early career elementary teachers report using in the teaching of mathematics?’ Each of NCTM’s Process Standards was represented by four unique pedagogical practices. Respondents were asked to record the frequency of their use of these practices in their current classrooms. Response choices were (1) ‘never used’, (2) ‘rarely - 1 of 5 lessons’, (3) ‘occasionally – 2 of 5 lessons’, (4) ‘often – 3 of 5 lessons’, (5) ‘very often – 4 of 5 lessons’, and (6) ‘nearly always – 5 of 5 lessons’.

In order to answer Research Question 1, individual frequencies and means were used to analyze individual strategies while group means were used to compare the five process standards. Usage of the 20 standards-based teaching strategies (See Tables 4.6, 4.7, 4.8, 4.9 and 4.10) varied widely. Seven strategies from four of the standards were designated as ‘never used’ in some teachers’ classrooms. These strategies were: Communication #3 ‘Students express mathematical ideas and thoughts in writing.’, Connections #2 ‘Connections of the math concepts to other classroom subjects are explored.’ and #4 ‘Students are encouraged to explore and describe mathematical connections.’, Reasoning #2 ‘Students are encouraged to generate multiple or alternative solutions to problems.’ and #3 ‘Students are encouraged to question solutions, strategies, processes, etc.’, and Representation #2 ‘Students are encouraged to create and use various representations to explain math concepts.’ and #3 ‘Students are encouraged to use various representations to solve problems.’ These results were worrisome as each of the strategies represented fairly easy-to-incorporate pedagogies. Equally surprising was that some of these same strategies were ‘often’ used by other teachers. As one example, Representation #3 which was ‘never used’ by 2 teachers and ‘rarely used’ by 7 teachers was ‘very often’ used by 22 teachers and ‘nearly always’ used by 18 teachers. This

indicated some large discrepancies in the use of some standards-based strategies in early career teachers' classrooms leading one to question why these broad discrepancies occur.

Communication strategy #4, "Students communicate mathematical ideas symbolically via manipulatives, drawings, graphical representations." received the highest mean of 5 indicating that it was the most commonly used of the strategies. The top ranking of this strategy paired with the low rankings of Representation strategies #2 and #3 presents an interesting dichotomy as, in this researcher's mind, these three strategies parallel each other. Perhaps some early career teachers do not view manipulatives, drawings and graphs as Representations and, therefore, do not perceive a connection. As elementary math methods professors are teaching the value of Connections to preservice teachers, they might consider making connections between the process standards, noting that none of the five is a stand-alone teaching strategy. In addition, and of special interest to this researcher, would be a more clearly delineated breakdown on the use of manipulatives (excluding drawings and graphical representations) by grade level and content area to determine if usage is consistent at all grades levels K-6 and over all mathematical topics.

Another Communication strategy, #1, "Students are encouraged to share/question mathematical ideas during whole class discussions." and a Representation strategy, #1, "Various representations of math concepts are presented by the teacher" tied for second and third in high usage. It might be noted that both of these strategies would be more likely to occur during a teacher-directed activity rather than a student-centered one.

Conversely, Communication strategy #3, "Students express mathematical ideas and thoughts in writing." received the lowest mean of 3.4167. Of interest is the fact that symbolic and oral communication ranked as the two most often used standards-based teaching strategies, but written communication ranked 20th out of 20 in usage. Receiving the second lowest mean, indicating low usage, was Connections #2, "Connections of the math concepts to other classroom subjects are explored." Representation #4, "Students are encouraged to compare and contrast various representations of the same math concepts." ranked third lowest in usage.

In analyzing these results, some conclusions on each of the Process Standards may be made. In using Communication in the classroom, most early career teachers

appear to encourage oral communication between the teacher and students and among students as they do activities. It also appears that most students are encouraged to use symbolic communication in the form of manipulatives, drawings and graphical representations. However, written communication, with the lowest mean of all 20 strategies, is, on average, used only 'occasionally' to 'often'. Twenty-three teachers indicated that they 'never' or 'rarely' have their students express mathematical ideas and thoughts in writing. Obviously, this powerful teaching strategy needs greater emphasis in methods courses and in areas of professional development.

All Connection strategies were used 'often' to 'very often'. Connections of the math lesson's concepts to other math concepts and to real life appear to be most thoroughly explored. Students also are encouraged to explore and describe mathematical connections. A third type of mathematical connection, to other classroom subject areas, seems to receive less attention in early career teachers' classrooms. The choice of 'never' or 'rarely' was chosen by 13% of the teachers and another 20% only chose 'occasionally'. Early career teachers appear to integrate mathematical concepts within math more often than within subjects. Discussion and assignments relating to making cross curricular connections could easily be incorporated into methods courses. Ideas for technology, literature, and science ties are readily accessible, but may not be obvious to methods students or early career teachers without intervention by the methods professor.

All of the means for strategies representing the Reasoning Standard are in the 'often' category. These means do not indicate, however, that teachers were in agreement on frequency of use of each strategy. Nearly one-third of the teachers indicated 'never', 'rarely', or 'occasionally' on 'encouraging student to generate multiple or alternative solutions to problems' while nearly 47% indicated 'very often' or 'nearly always' for this same strategy. Likewise, 31% of the teachers chose 'never', 'rarely', or 'occasionally' for 'encouraging students to question solutions, strategies and processes', yet 41% used this strategy 'very often' or 'nearly always'. These variations in the low to high usage were broader than on other process standards. These results might lead one to question if student-centered methods courses where teacher candidates are encouraged to question, generate multiple solutions, and justify their own conclusions might encourage the teaching of stronger reasoning strategies by early career teachers.

The teacher-centered Representation strategy #1, 'Various representations of math concepts are presented by teacher', appears to have much broader usage than the student-centered strategies #2, 3 & 4. Ranking second highest of all 20 strategies, according to its mean, early career teachers 'very often' explain mathematical concepts to students using various representations. However, student creation and use of representations to explain/solve problems, encouraging students to compare and contrast various representations, and having students question solutions or generate multiple or alternative solutions have less frequent use. Based on these results, it appears some early career teachers are either uncomfortable with these student-centered pedagogical strategies or did not come to view them as important during their methods course(s).

Means were most consistently high and reflected the lowest range for the Problem Solving strategies. No teacher chose 'never' on any of the four Problem Solving strategies and only 14 teachers chose 'rarely'. This Process Standard had the fewest teachers choosing low usage of the four strategies representing it and the most teachers making high usage choices for it. With means ranging from 'often' to 'very often', early career teachers appear to guide students toward solutions rather than providing answers, teach math concepts in the context of problem solving, and focus on understanding of the concepts taught. A focus on problem solving in both methods courses and during professional development over the past few years appears to have made teachers more cognizant of its important role in a mathematics classroom.

Ranges and averages of the means of the four strategies for each standard were also determined (see Table 4.11). Though there was not a wide variation in scores, some differences are worth noting. Problem Solving appears to be the most frequently used Process Standard with a mean of 4.6057. Problem Solving also had the least range in scores, 3.5, indicating less variability in its frequency of use. Representation had a mean of 4.5223, Communication had 4.4871 and Connections averaged 4.4124. Reasoning had the lowest mean of 4.3229 and highest range, 4.25. It appears that Reasoning strategies are used the least frequently by early career teachers and the frequency of use among early career teachers varies the most. It should be noted that, with average means ranging from a low 4.3229 for Reasoning to a high 4.6057 for Problem Solving, the means of the strategies for each standard all fall in the 'often' to 'very often' use category.

Responses to the associated open-ended survey question ‘Please share any other comments that support or better explain your use of standards-based practices in your classroom’ could be categorized as 1. reasons why standards-based strategies are/are not used and 2. other strategies used. A few teachers deemed standards-based strategies inappropriate for primary learners or struggling learners. The general consensus of these teachers was that teaching of computation skills was sufficient for these groups. This concept that younger children or struggling learners must master content skills before using process skills is troublesome to this researcher and deserves further consideration in future research.

Specific math curriculum programs and lack of materials were also cited as prohibiting good use of standards-based methods. Blame was also placed on methods courses for not placing sufficient focus on choosing a math program and on teaching to state standards. Similar responses regarding standards were found in the responses to open-ended survey questions for Research Questions 2 and 3. Without a focus on the Process Standards and their connection to curriculum materials and state standards, it seems less likely that early career teachers will incorporate standards-based practices in their classrooms.

The math series Everyday Math received praise for its support of standards-based practices. Teachers noted other specific pedagogical practices used which they felt supported standards-based teaching. These practices included exploring various solution methods which supports the Reasoning Standard, group discussion with good directive questioning which supports the Communication Standard, and the use of manipulatives which upholds ideas from both the Representation and Communication Process Standards.

Question 2

Survey questions 3-8 were associated with Research Question #2 “What aspects of their elementary mathematics methods course(s) do early career teachers feel facilitated their use of standards-based practices in their classrooms?” Eight standard pedagogical practices were rated from ‘did not benefit me’ to ‘was only somewhat beneficial’ to ‘was beneficial’ to ‘was very beneficial’. Teachers were also given the option of stating if a particular strategy was ‘not used’ in their methods course.

The eight strategies (called ‘aspects’ in the survey) were 1. ‘Presentations by the instructor with discussions and the opportunity for questions’ 2. ‘Participating in activities (i.e. using manipulatives or playing games)’ 3. ‘Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples (any or all of these)’ 4. ‘Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)’ 5. ‘Reading and reflecting (i.e. the course text, journal articles, etc)’ 6. ‘Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)’ 7. ‘Observing in actual classrooms OR Working with a single student (either or both of these)’ 8. ‘Planning and teaching lessons in actual classrooms’.

Respondents classified these eight aspects in each of five Central Tasks of Preservice Preparation (Feiman-Nemser, 2001). Italicized additions are this researcher’s rewording of the task as it applied to this research. These tasks were ‘developing subject matter knowledge for teaching’, ‘developing understanding of learners and learning’, ‘developing a beginning repertoire’ (*standards-based teaching strategies*), ‘analyzing beliefs and forming new visions’ (*concerning standards-based teaching*), and ‘developing tools to study teaching’ (*an attitude of a life long learner*). Six survey questions, five closed and one open, provided data to answer Question 2.

Quantitative data was compared and analyzed in a variety of ways. First, comparisons were made of frequencies of teacher choice in the degree to which each strategy benefited them for each of the Central Tasks of Preservice Preparation (Feiman-Nemser, 2001) (see Table 4.12). Frequencies were also noted on the choice of ‘did not do this in my methods course’. Data indicated that ‘Viewing videos of teacher and students or discussing case studies or analyzing student samples’ was not used in 20-25% of these early career teachers’ methods courses. Frequency of the ‘did not do’ choice for this aspect was especially high with a range from 22-28 teachers, while frequencies for ‘did not do’ only ranged from 0-12 in each of the seven other aspects. ‘Observing in actual classrooms or working with individual students’ had the second highest range of 8-12 for ‘did not do’. This data could indicate that 8-12% of these early career teachers were not given the opportunity to observe or work with individual students during their methods course(s). The frequency range for the aspect of ‘planning and teaching lessons in actual classrooms’ was third highest with 6-10 teachers choosing it for each category. The data

from the ‘observing’ and ‘planning and teaching’ categories would indicate that a small percentage of methods courses do not incorporate a classroom component.

‘Observing in actual classrooms or working with individual students’ and ‘Planning and teaching in actual classrooms’ were overwhelmingly considered to be the most beneficial aspects of methods courses in individual categories. ‘Planning and teaching’ was chosen to be the most beneficial for each of the five central tasks and ‘Observing’ was chosen to be the second most beneficial for each of the five central tasks. It should be reiterated that a number of early career teachers did not experience ‘Observing or working with individual students’ yet it ranked 2nd for its degree of benefit. In contrast, ‘Reading and reflecting’ had the most ‘did not benefit’ and ‘only somewhat beneficial’ in every methods course aspect. ‘Reading and reflecting’ appears to have been used as a pedagogical practice in nearly every teachers’ methods course, but these early career teachers did not consider the practice particularly beneficial in preparing them to teach in a standards-based manner.

The statistics program PASW was used to remove the numerical option of ‘did not do this in my methods course’ and means were determined for the one through four options for each aspect of teaching and in each task area. By ranking these means, the data could be analyzed from another perspective (see Table 4.13). The results corroborated the findings presented in Table 4.12. ‘Planning and teaching’ ranked highest in the areas of ‘Subject matter knowledge’, ‘Learners and learning’, ‘Teaching strategies’, and ‘Becoming a life long learner’, and second in ‘Beliefs’. ‘Observing’ ranked first in the ‘Beliefs’ and second in each of the remaining four Central Tasks of Preservice Preparation. In other words, these two teaching strategies were considered to be the most beneficial in developing skills and positive attitudes about standards-based teaching. Also supporting the findings from Table 4.12, ‘Reading and reflecting’ was ranked at the bottom of the list for four of the categories and next to the bottom for the fifth category. ‘Participating in activities’ was chosen as the third most beneficial methods teaching strategy in each of the five categories. If they can not be observing or teaching in an actual classroom, early career teachers appear to feel that doing hands-on work with manipulatives and playing the actual games being suggested for classrooms best prepared them to incorporate the Process Standards into their own classrooms.

In a final analyzing of the data, all five means for each teaching strategy were averaged (see Table 4.14). Not surprisingly, ‘Planning and teaching’ ranked first, ‘Observing’ ranked second, and ‘Reading and reflecting’ again fell at the end. With means of 3.79 and 3.74, respectively, ‘Planning and teaching’ and ‘Observing’ were considered ‘very beneficial’. With the lowest means of 2.98 and 2.82, ‘Viewing videos’ and ‘Reading and reflecting’ were only considered ‘beneficial’. Based on averages, all of the eight teaching strategies were deemed to have at least minimal benefit, though individual frequencies indicate that views on the degree of benefit vary widely among early career teachers.

The actual quotes (see Table 4.15) from the open-ended question that were aligned with Research Question 2 added dimension to early career teachers’ opinions about beneficial aspects of their methods course(s). In line with the quantitative data, the majority of the positive comments most supported ‘Planning and teaching’, then ‘Observing’, then ‘Participating in activities’. Of special interest were the comments directly related to improving methods courses. Teachers both explained why their methods course was ineffective and gave suggestions for additions that would improve courses. Most often mentioned were ideas involving standards. Either there was a reported lack of standards-based instruction or teachers suggested more instruction on connecting the curriculum to the standards or going over the standards and ways to teach to those standards.

Research, as noted in Chapter 2, suggested that many criteria may negatively impact early career teachers’ use of standards-based teaching strategies supported in methods courses. Lortie (1975) supported the theory that the ‘apprenticeship of observation’ exerts an influence that a methods course may not be able to overcome. Research by LaBerge and Sons (1999), Cady, Meier, and Lubinski (2005b), and Feinam-Nemser (2001) supported similar views. Bramald, Hardman, and Leat (1995, p. 30) concluded that, “Further work, therefore, needs to be carried out to understand the variables that influence teacher thinking so that they may be incorporated into course designs”. The responses to these survey questions, combined with the differentiation into Feiman-Nemser’s (2001) Central Tasks of Preservice Preparation, offer elementary mathematics methods professors a framework to “understand the variables that influence

teacher thinking” (Bramald, Hardman, and Leat, p. 30). Early career teachers tell us that more time in actual classrooms, working with actual students, and participating in activities better prepared them to use standards-based strategies. Methods courses with no classroom component, obviously, can not satisfy this suggestion. In their opinion, reading and reflecting the course text or journal articles do not provide an adequate substitute for hands-on practice and authentic classroom experience.

Question 3

While Research Question #2 asked early career teachers what aspects of their elementary mathematics methods courses facilitated their use of standards-based practices in their classrooms, Research Question #3 asked early career teachers what changes in their methods courses would better prepare them to use standards-based practices in their classrooms. A few respondents referred to components that they wished had been a part of their past course(s) but most suggested improvements for methods courses of future elementary candidates. Survey respondents ranked the same eight pedagogical practices used for Research Question #2, choosing a first, second and third place. These ranking values were then added and averaged to determine which options they believed would most improve an elementary mathematics methods course. Responses on an additional open ended question provided the opportunity for teachers to give suggestions outside of the provided choices.

There are similarities and differences in early career teachers’ opinions when comparing their past methods course(s) for Research Question #2 to their suggestions for future methods courses for Research Question #3. Although teachers consistently ranked ‘planning and teaching’ as the most beneficial in preparing teachers (Research Question #2), ‘Observing’ ranked first more often for Research Question #3. ‘Observing’ was first in four of five categories and second in the fifth category. ‘Planning and teaching’ had no first place rankings, three second place rankings, and two third place rankings.

When all eight teaching strategies were ranked for Research Question #3 (see Table 4.17) according to total sums for first, second or third place, ‘Observing’ held a strong first place with a total of 706. ‘Planning and teaching’s’ total of 547 is distinctly lower. As noted in the discussion on Research Question #2, a number of teachers did not get to observe in their methods course(s). This fact may account for the second place

rankings related to ‘Observing’s’ past benefit, but its first place ranking when respondents were asked for improvement suggestions. That said, this distinct switch of first and second place rankings of ‘Observing’ and ‘Planning and teaching’ is an interesting outcome which deserves further consideration and verification.

Multiple positive comments and no negative comments (see Table 4.18) further supported the use of the strategies of ‘Observing’ and ‘Planning and teaching’. On the open-ended question, one teacher wrote, “they [methods students] need to be able to view teachers actually teaching curriculums and standards.” Another wrote, “Watch master teachers using standards-based practices and discuss why they’re effective.” Two conditions might resolve this request to observe models of good teaching. One solution would be to have, as mentors, only those teachers who use standards-based practices in their classrooms. However, finding a sufficient number of these teachers who are willing to mentor might prove to be an obstacle. Another possible solution is suggested in research by Feinam-Nemser (2001), Flores (2001), and Zeichner and Gore (1990). Feinam-Nemser indicated, though professors might stress the benefits of reform-based practices, they may actually be using very traditional practices in their own classrooms. In addition to, or in lieu of, modeling of good practices by mentor teachers, professors may need to alter their own teaching strategies to those of a more standards-based nature.

On Research Question #2, ‘Examining curriculum materials (including NCTM and state standards)’ only ranked sixth overall in its benefit to teachers, but as noted in earlier discussion, received multiple suggestions for its stronger inclusion on the related open-ended survey question. In relation to Research Question #3, which focuses on improving future methods courses, ‘Examining curriculum materials’ ranked first under the area of improving teacher candidates’ knowledge of ‘Teaching strategies’. It ranked third in the area of ‘Developing subject matter knowledge’ and fourth for ‘Developing beliefs about standards-based teaching’. ‘Examining curriculum materials’ rankings placed it as the third most suggested improvement for future courses. The obvious support for this methods teaching strategy indicates a need for more focus on looking at NCTM and state standards in methods courses. Individual teacher comments also lead to the conclusion that early career teachers want more focused effort on using these standards to develop lesson plans and on matching school curriculum materials to these

same standards. Teachers suggested using math curriculums representative of the NCTM standards, creating teaching materials which focused on the standards, and “giv[ing] more opportunity to become familiar with the standards.”

This researcher suggests a strong connection between ‘planning and teaching’ and ‘examining curriculum materials’ and the connected teacher suggestion of ‘using standards to develop lesson plans’. As students plan and teach in a mentor’s classroom they are, necessarily, creating lesson plans. Required components for such lesson plans might include standards-based connections. Prerequisites for lessons could include student use of various types of *communication*, *connections* to other subject areas or to other areas of mathematics, good questions that encourage student *reasoning*, good examples to support *representation*, and *problem solving* components. As students planned standards-based lessons to be taught in actual classrooms, two early career teacher suggestions would be accomplished in a natural and logical manner.

The requested level of inclusion of appropriate ‘Presentations by the instructor with discussions and the opportunity for questions’ is indicated by its fourth place ranking. Its rankings in the individual aspects (see Table 4.16) in the categories of ‘Beliefs’ (2nd/3rd), ‘Teaching strategies’ (4th), and ‘Learners and learning’ (4th/5th) are interesting in comparison to its seventh/eighth place ranking for ‘Subject matter knowledge’. Reflections on and discussions about the strengths and weaknesses of lessons planned with a standards-based perspective could serve to enhance the development of standards-based ‘beliefs’, and ‘teaching strategies’, and ‘understanding learners and learning’. Planning, teaching, and discussing standards-based lessons could benefit not only the methods students’ future use of standards-based strategies, but could serve as a model as they were taught in classrooms of mentor teachers with more traditional teaching perspectives.

An overall fifth place ranking for ‘Presentations’ as a methods teaching strategy for Research Question #2 and its overall fourth place ranking for Research Question #3 indicates that teachers consider ‘Presentations’ to be important, but not central to an effective methods course. Perhaps early career teachers agree with research by Manouchehri (1995) that professors’ practices in teacher education programs need to reflect the standards-based theories that they espouse. In many methods classrooms,

teacher candidates may be being viewed as passive learners with the lecture method of instruction being common. Perhaps, in future research, ‘Presentations’ should be separated from ‘discussions and the opportunity for questions’ instead of provided as one combined choice. The two, when separated, might elicit very different responses for early career teachers.

Drawing conclusions regarding ‘Participating in activities’ was difficult as a result of its varied rankings and range of teachers’ comments. Multiple positive comments support it as a viable methods teaching strategy and it had a strong third place ranking on Research Question #2. However, for Research Question #3, its overall ranking was fifth of eight and its individual rankings for the five tasks were widely scattered. It was placed third for developing an understanding of ‘Learners and learning’, fourth for developing ‘Subject matter knowledge’, fifth for two categories and seventh for the remaining one. In other words, teachers felt that it was quite beneficial to them in past methods courses, but did not support it as strongly as an important component of future methods courses. Mixed reviews allow this researcher to offer the personal opinion in this case. Elementary mathematics methods courses should be modeled on the same constructivist perspectives the Process Standards support. Therefore, this researcher judges ‘Participating in activities’ to be a valuable component of future math methods courses.

‘Viewing videos of teachers and students or discussing case studies or analyzing work samples’ was ranked as the second to the least favorable recommendation for methods courses. Personal comments were only negative and it was ranked sixth in four of the five Central Tasks. Low rankings on Research Questions #2 & #3 would indicate that methods professors should question their validity, justify the time required to include them and verify the quality of those that they choose to use in their methods courses.

‘Reading and reflecting’ filled all but one of the remaining sixth through eighth place slots and ranked sixth overall. The following comment is representative of respondents’ comments, “Stop reading the book!” Throughout the entire review of early career teacher comments and rankings, textbooks did not make a positive showing. Considering textbook’s low rankings, methods instructors may need to reconsider their focus on textbook reading assignments and/or on the value placed on the text content by teacher candidates. Perhaps carefully selected readings on focused topics, followed by

appropriate discussions of classroom applications, would prove more effective than broader assignments of “Read Chapter X”.

‘Teaching classmates or role playing or making presentations to the class’ consistently ranked at the bottom as an aspect for improving methods courses in support of standards-based teaching. Under personal comments it was considered “awkward and unreal” (see Table 4.18). In overall totals, it was ranked eighth of eight (see Table 4.17) and was ranked seventh or eighth in four of Feiman-Nemser’s (2001) five Central Tasks of Preservice Preparation (see Table 4.16). Though frequencies from Table 4.12 indicate that this is a fairly common practice in methods courses, early career teachers suggested that it not be a strong component of future methods courses.

Consideration on the inclusion of any of the afore-mentioned eight aspects in an elementary mathematics methods courses must be given to the fact that the focus of this research was on the NCTM Process Standards. Early career teachers were allowed to comment on all aspects of a methods course by organizing the survey based on Feiman-Nemser’s (2001) Central Tasks of Preservice Preparation. However, respondents’ thinking was always referred back to standards-based teaching. Any or all of the rankings by early career teachers may have varied if the research had focused on, for example, handling classroom management issues or finding funding for classroom supplies. In other words, all conclusions drawn here on the inclusion/non-inclusion of various strategies in an elementary mathematics methods course, should be qualified as being based on teaching standard-based subject matter.

Recommendations for Further Research

Based on the results of this study, recommendations for future research can be grouped into two categories: research on early career teachers’ use of standards-based practices in their classrooms and research on ways to improve to elementary mathematics methods courses.

Research on Early Career Teacher Use of Standards-Based Practices

Some Process Standards appear to necessitate more focus in methods courses than do others as we attempt to ensure the broad use of standards-based practices in elementary mathematics classrooms. Problem solving scores indicate a fairly broad base of usage and, in comparison to the other process standards, does not reflect a strong need

for follow-up study. Reasoning scores, however, indicate a fairly narrow focus in early career teachers' classrooms. It appears early career teachers may not understand the benefits of encouraging students to question solutions and generate alternative ones. Other standards-based strategies that are not widely used include the use of written communication in mathematics classrooms, making connections between mathematics and other subject areas, and encouraging students to represent solutions to problems in various manners. Future research suggestions could include interviews with early career teachers to gain more personal perspectives on these issues. Insights might also be gained from observing early career teachers to ascertain if they are, in fact, incorporating more or fewer standards-based strategies than they actually realize. Give and take conversations might clarify misconceptions early career teachers have about the benefits and practices of using these standards-based teaching strategies, especially when teaching younger students or struggling learners.

Conversely, perhaps early career teachers *do* realize the value of standards-based teaching, but other outside forces inhibit their use in the classroom. This alternative thinking leads to research questions concerning the possible impact of classroom management issues, poor curriculum materials, more traditional veteran teachers or administrators, or the effects of the heavy emphasis on assessment. In these cases, research into successful approaches for strengthening early career teachers' belief systems would be appropriate. Numerous researchers (Feiman-Nemser, 2001; Hart, 2001; Raymond, 1997) have suggested that, by addressing beliefs, teacher educators might have greater influence on teacher practice.

Of additional interest might be similar research addressing the practices of teachers after their fourth or fifth year of teaching. Longitudinal research by Cady, Meier, & Lubinski (2005b) provided some evidence that the influence of methods courses perhaps took a few years to materialize. Some of the teachers indicated that they were able to become more open in their teaching as they became more confident in dealing with discipline issues, more efficient in their use of time, and more likely to stray from the text.

Research on Improving Elementary Mathematics Methods Courses

Survey responses from early career teachers on Research Questions 2 & 3 are fairly clear on early career teachers' suggestions for future elementary mathematics methods courses. Early career teachers feel that two aspects of methods courses, 'observing in actual classrooms or working with a single student' and 'planning and teaching lessons in actual classrooms', were the most beneficial for them. Several research possibilities arise as the result of these suggestions.

As indicated by data, a small percentage of methods courses do (or did) not include a classroom component of 'observation' or 'planning and teaching'. Studies comparing the effectiveness of methods courses with strong and weak classroom components would seem a natural follow-up to such results. Because only 60% of this survey's respondents considered the process standards to be a central focus of their methods course, another obvious question involves research on a larger population to support or refute this percentage.

If, in fact, more classroom observation and teaching was incorporated into methods courses, other concerns might arise. Of special interest to this researcher would be the effect of 'traditional' versus 'standards-based' mentors during these classroom experiences. Teacher candidates often 'don't know what they don't know' so the question becomes, "Does a mentor with traditional mathematics teaching practices, but with a pleasant attitude and good classroom management skills, lead teacher candidates to question, even if inadvertently, instead of believe in, standards-based practices?" Darling-Hammond and colleagues (2005) and Manouchehri (1996) support the need for carefully designed field experiences. When mentor teachers support the practices being encouraged by the education departments, it was much easier for preservice teachers to implement reform-based practices (Cochran-Smith & Zeichner, 2005). Therefore, teacher candidates need to be assigned to cooperating teachers who use standards-based practices (Manouchehri). The determination of which teachers could serve as competent mentors and/or the training of these teachers to serve as standards-based mentors would require masterful and sometimes delicate tact.

Another suggestion from the early career teachers was that more time be spent on learning the actual standards. In closed survey questions, teachers supported 'examining

curriculum materials (i.e. NCTM & state standards, student texts, resource books)'. In open survey questions, teachers suggested going over specific standards and developing lesson plans that support standards. Some early career teachers appear to feel unprepared in understanding and using NCTM and state standards as they develop lessons and teach to their district's curriculum. Strategies for incorporating more actual study of the Process Standards would appear to merit time and research.

In the limited time usually accorded to elementary mathematics methods courses, appropriate allocation of time is a necessity. Three aspects, 'reading and reflecting', 'teaching classmates or role playing or making presentations to the class', and 'viewing videos of teachers and students or discussing case studies or analyzing student work samples' repeatedly ranked lower in early career teachers' ratings. Research could determine if these are, in fact, viable methods components. Perhaps they are overused in some methods courses or are used in lieu of actual classroom experiences. Considering that two of these aspects had multiple components, the value of each separate practice could be assessed.

Finally, in the area of improving methods courses, professors' practices in teacher education programs need to be studied. Do these practices actually reflect the standards-based theories that these same professors advocate or is the lecture method prevalent as suggested by Manouchehri (1995)? Do professors teach the Process Standards, but not connect one to the other? Do classroom components include both the opportunity to observe and to plan and teach lessons? Are mentor teachers chosen on the basis of their use of standards-based practices? Teacher education programs may need to instigate internal reviews of their own programs to determine if their own teaching practices and those of their mentor teachers are consistent with the message that they are conveying.

Conclusions

The Principles and Standards for School Mathematics support the idea that quality teachers have a significant impact on student learning and on students' attitudes toward mathematics. The task of adequately preparing preservice teachers to effectively accomplish this goal falls on schools of education, especially on elementary mathematics methods courses. This task is particularly daunting given the number of preservice teachers who, because of their past classroom experiences, harbor strong traditional

beliefs about how mathematics should be taught and, in many cases, view “fashionable innumeracy” as acceptable.

This survey research was designed to fill a gap in current research relating to the impact of current methods courses on the use of standards-based practices, particularly the NCTM Process Standards, in early career elementary teachers’ mathematics classrooms. Early career teachers were provided the opportunity to relate their opinions on their own methods experiences and to provide suggestions for improving methods courses of the future. The categories were organized according to Feiman-Nemser’s (2001) Central Tasks of Preservice Preparation.

Early career teachers appear to use strategies supporting the Process Standard of Problem Solving quite often and strategies supporting portions of Communication, Connections and Representation often. However, strategies supporting Reasoning appear to be used less frequently. Applicable future research might relate to why teachers incorporate and encourage the use of some Process Standards while others are used less frequently.

From a choice of eight elementary methods teaching practices, ‘Observing in actual classrooms or working with individual students’ and ‘Planning and teaching in actual classrooms’ were overwhelmingly considered by early career teachers to be the most beneficial aspects of their own methods courses. These two practices were also most highly recommended as strategies that would improve methods courses for future students.

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Appendix A - Analysis of Young and the Rest of Us

THE YOUNG AND THE REST OF US

The training that you have received to become an educator

1. Where did you receive your education (university)?

130	Out of state
115	Kansas State University
60	Emporia State University
39	Fort Hays State
35	Pittsburg University
28	Kansas University
23	Wichita
70	Other Kansas universities or colleges

2. Are you teaching out of your field?

yes	75	(14%)
no	481	(75%)

3. Are you comfortable with the level/subject in which you have been assigned?

very uncomfortable.	45	(8%)
uncomcomfortable	4	(1%)
fairly comfortable	13	(2%)
comfortable	103	(19%)
very comfortable	387	(70%)

4. Were you involved in new teacher orientations before school started? Was it helpful?

175	yes only, yes/yes, yes/somewhat	Many mentioned overload, orientation was just forms, wanted more time with veteran teachers
80	yes/no	Attended, but not helpful or minimally helpful
103	no	About 1/3 were hired late or mid year, others just said no
68	no	This didn't address them or they were mentors

5. Are resources given to help early career teachers with student discipline and classroom management? Are they effective?

184	no	Some of these said they had a mentor, but that wasn't a specific job of theirs or they didn't address it, some just rely on administration as needed, what was offered was ineffective
419	yes	Harry Wong, Love and Logic, Ruby Payne, Fred Jones, a lot just said they could ask a mentor, a team members, or principal - most categorized as effective, but about 10% said more is needed
45		Comments didn't fit either category - some commented on being too old to comment or didn't know, 5-6 comments (from experienced teachers) on college not teaching what is needed or teaching ineffective methods, 10-12 comments from new teachers about only relying on what they learned in college

A lot of respondents just addressed what's available in their school or made personal commentary on disciplining, mentors were the most often mentioned resource

Understanding the administrative support at your school

6. What kind of support were you given as far as district guidelines, procedures, student standards & expectations? Was this helpful? If not, why?

223	yes	Many times just given a book, but it helped to be able to refer to during the year, mentors noted as especially helpful- often that was the only thing mentioned
129	no	Given little support or had to find things out on their own, many said that they were just handed a book and/or it was part of too much info presented in first days. Special ed teachers feel especially alone being the only one in their building so no special ed mentor to turn to
10		No opinion either way
4		Stated that they already answered in previous question
60		Said they were not a new teacher - told what happened to them long ago or what they do as a mentor (which is always positive and /or better than anything they ever got)

It was difficult to tell on this question to tell who was an early career teacher and who wasn't

7. What kind of support are early career teacher given throughout the year?

about 450 responses

10+%	Negative responses - if help was received it was not worthwhile
10%	Responses by experienced teachers who didn't know about early career or who related their feelings as a mentor
10%	Only stated mentors or meetings with mentors - no positive or negative assigned

Mentors were named about 20 to 1 over any other resource for this area. Mentors received mostly positive comments, but negative comments included that many mentors don't meet with their mentees or only do at the first of the year (with suggestions that they needed to be required to meet with mentees or that administration need to monitor mentors, especially in cases where mentors are being paid)

Required paperwork and required meetings (whether large group or only pairs) were generally regarded as unproductive, but time to meet was the most mentioned problem. Mentors from the same grade level/team/subject area seemed to be most productive.

Team members received positive comments as did peer assistants, literacy coaches, peer coaches, instructional coaches, School Improvement Specialists, district mentors, and local KNEA assigned buddies.

Administrators received mixed reviews, most comments involved evaluations.

Professional Learning Communities, Master Teacher materials, Danielson's Framework discussions, an Early Career Teacher course offered at PSU, and new teacher meetings held throughout year were noted neither positively or negatively.

8. What role does the principal play in supporting and guiding you as an early career teacher? Is it adequate? If so, why not?

224	Principal does a good job - reports were most often very positive
100	Principals' support isn't adequate
88	Unclear, stated they were a mentor or veteran, n/a

Reasons for principal's support not being adequate: most related to time (too busy/has too many responsibilities/too many new teachers). Others were not a good communicator, in another building, wants everything done his way, only concerned with state assessments, NCLB pressure, doesn't understand sp.ed laws, no experience as a teacher or as a teacher at this level, no follow through, discipline issues. Mentor, veteran teachers, and instructional coaches have a lot of this responsibility. The most often mentioned principal responsibility is evaluation/observation.

9. Does your district culture support early career teachers? How?

264	Yes
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56	No	Sink or swim attitude, teachers too spread out, mentors don't have time or do their job, not all good teachers mentor well
49	Yes & No	Getting better/depends on mentor/good early, but not later, pros & cons listed
51	Don't know/na/answer didn't apply	

Main support is mentors (often with nothing else listed), coaches, team members, instructional coaches; classes/conferences/in-services/training/workshops, PLC's, pay scale supporting new teachers

Your wants and needs for professional development

10. What kind of professional development and/or training and support, are early career teachers given for mathematics and reading state assessments, expectations, resources available, etc.? Are they adequate? Why or why not?

108	Offerings are adequate - didn't answer the 'what kind' or 'why'
98	Not adequate - didn't answer the 'what kind' or 'why'
68	No help
29	Learned on job or not much
89	In-services or professional development
42	Discussions at faculty meetings, team meetings, PLC
39	Learned from other teachers/mentors
12	Given paper resources
6	Online resources
5	Went over results
4	Principal
5	University or service center presentations
88	Not applicable or don't know

11. Did your district provide professional development for implementation of standards-based curriculum? Was it adequate? Why/why not?

199	Reported receiving in-services/presentations on something About 1/2 of those thought that the training was adequate to very good. About 1/4 felt it was inadequate w/ reasons inc. not enough; provided too late in the year; needed more follow up; and good at first, but not enough in following years especially with new teachers. About 1/4 didn't include an opinion
112	Stated n/a, don't teach math, not sure, or reported on *training on state assess, discipline programs, etc.
58	Stated no but many of these may not relate the math curriculums stated

12. What are your career goals? What do you want to do to grow professionally? What is needed to support you in achieving your goals? (Respondents listed 1-6 goals)

- 95 Grow as a teacher/be an effective teacher/make a difference with students/etc.
- 77 Get masters degree (many said they already have this)
- 20 Pursue doctorate
- 19 Become administrator/superintendent
- 18 Survive till retirement, be able to stick with it
- 13 ESL certification
- 12 Be a better mentor
- 12 Curriculum leader/director/coordinator in district
- 12 Become more technology-savvy
- 11 Teach teachers
- 10 Stay current/take some hours/participate in professional development
- 6 National Board Certification
- 5 Teach college
- 5 School counselor/psychologist
- 4 Broaden experience by switching classes taught or teaching out of country
- 3 Stay in special ed, but switch to reg. ed because of stress
- 3 Do professional writing
- 3 Consultant
- 3 Leave education
- 1 Library certification

Most wanted support of time and money (grants, district help, higher salary to be able to afford courses, district offers inservices on needed topics, flexibility in teaching schedules to attend courses, more money in salary schedule for professional development, more support for attending conferences), sabbaticals supported

Other desires were being treated as professionals, quality special ed resources, support as teacher leader, time to collaborate, mentor training, help writing grants

Teachers plan to get more involved in committee work, read more professional literature, take part in provided professional development

Many teachers reported that districts were very supportive of their career goals

How teachers collaborate in your schools

13. Are teachers given time to collaborate? If not, why?

- 203 Yes, but some of these were after school, only once a month, during plan time, after school, at lunch, during inservices, and many said “not enough”
- 48 No scheduled times - some said other schools in district do or some grade levels do
- 7 No appropriate response

Reasons for no time included lack of another of the same type of teacher in school (special ed), scheduling problems, administration who don't value it, filled with agenda items or scheduled topics, specials teachers didn't when regular classroom teachers did, would take away plan time, not enough time

14. Were you assigned a mentor? Was he/she helpful? What do you feel is most important that a mentor do for you?

It was difficult to distinguish who was an early career teacher and who was a veteran

- | | | |
|-----|--|----------------|
| 140 | Yes to assigned | Yes to helpful |
| 33 | Yes to assigned, | No to helpful |
| 80 | Didn't have a mentor | |
| 83 | Not applicable or they gave their opinions on being a mentor | |

Most often listed as important were: answer questions, help w/district policies & paperwork, be supportive, be a 'safe' person to go to for advice or listener.

Also listed as important were: honest feedback, provide resources, observe and give suggestions, help through first weeks, discuss curriculum, suggestions on classroom management, help with lesson planning, collaborate, be a friend, & help with technology

Listed as reasons mentors weren't helpful: not trained, too busy or lack of time, not interested in helping, mentee didn't need help/was only new to district, but not to teaching, constantly compared mentee to other mentees, never came by, didn't teach nearby or didn't teach same subject/grade level, only waited till mentee asked questions

15. How do veteran and early career relate? Are veteran responsive to new teacher ideas, concerns, or early career experiences?

210	Said that they relate well - difficult to tell if these were new or veteran teachers		
55	Veteran teachers	yes/no	New teachers think they're going to change the world/are afraid to speak up
31	New teachers	yes/no	Veteran teachers don't want to change/set in ways/don't understand technology/jealous disapprove of work quality/won't listen to new research/ "know it won't work"
13	New teachers	no	Veteran teachers don't care that they are struggling, don't remember what it's like to be new, are set in ways, aren't open to new ideas, are intimidated, think veterans are "burned out" and that they could be more patient
5	Veteran teachers	no	They don't relate feeling that novice teachers are arrogant, tell us they know it all, won't listen to our ideas

16. Are there professional development opportunities that you would like to see offered? What are they?

95	Professional opportunities provided were sufficient or didn't have any they would want to attend
25	Classroom management
23	Technology
18	Reading (7 of these were guided reading)
13	Math
10	Curriculum or simply content areas
10	Teaching to standards/state assessments
5	Writing
3	Science

17. What are the perceptions of district in the community? Are parents involved in their children's education?

Wide variety of responses with more positive than negative - some stating they don't know

Availability of appropriate resources

18. Is technology available to you (email, online forums, electronic bulletin board) to support new teacher communication?

Nearly every response was positive-email everywhere - online forums and e bulletin boards not as common

Only 8 reported their district was falling behind or training was needed

19. Are there resources that you need that you do not have? What are they?

139	Have everything they need
technology	22 Smart boards, 16 LCD projectors, 14 more computer access for students (carts or labs), 9 Elmos, 9 updated tech in school (incl. wireless), 5 laptops, 3 clickers, 2 printers, 2 - E bulletin board, 2 - tech person, 1 camera, 4 tech training
12	Classroom materials - mainly math and science manipulatives
10	More time - to teach, collaborate, plan
8	Teaching strategies (research based, presented by professionals (3 ask for reading strategies)
3	Help/support staff
2	Classroom books/curriculum materials
1	Basic tables and chairs
1	Copy of state standards

How effective the survey is

20. Please list the top 3 concerns that you have as an early career teachers.

323 responses

107	(33%) were veteran teachers or had no response
Time - 42	in general/time management/loss of personal time, 17 for collaboration, 9 for planning, 8 for teaching
73	discipline/classroom management
54	Varying states' requirements
40	State assessments/testing/NCLB/teaching to tests
33	Understanding standards/curriculum, learning material/staying educated/ pro devel/sufficient content knowledge/diversity training.
31	Stress/burnout/doing it all/amount of work
28	Parents - support/responsibility/communicating
28	Am I teaching right things/ meeting the standards/differentiated instuction

- 20 Mentoring help on lesson planning, procedures, questions
- 19 Salary/benefits
- 18 Effective teaching /not just conforming/ helping student enjoy school/inspiring students
- 16 Getting along with/respect from older teachers & other teachers
- 15 Support from administration/poor administration
- 13 Funding/resources/materials/facilities
- 12 Up-to-date technology/keeping up with tech
- 12 Setting up a classroom/scheduling/planning/understanding school procedures/grading/getting what you need
- 12 Student accountability/motivation/respect
- 11 (+4 ELL) Special needs students/IEP's/struggling students
- 9 Tenure/keeping a job
- 7 Communication
- 7 KPA
- 6 Class size/student-teacher ratio

21. In terms of providing a means for you to express your views about your first years of teaching, this survey was:

Very inadequate	13	2.36%
Inadequate	12	2.7%
Fairly adequate	84	15.2%
Adequate	137	24.8%
Very adequate	60	10.8%
No response	246	44.6%

22. What question/topic do you feel should have been addressed in this survey that wasn't?

- 47 All covered or no questions to add
- 29 Not applicable or I don't know
- 25 It wasn't for career teachers/why did career teachers have to do it/didn't address mentor point of view
- 56 Made suggestions:
 - 8 - on the survey quality: was too long (5)/what info. will be used for/use more scales to make it easier to compare/this should be a starting point for gathering more info./more on what you're pleased with (survey seemed negative)
 - 8 - on administration/district: does administration care/do they support you & how can districts support you/did observations help you grow as a teacher/does school board support instruction as they do athletics/why aren't instructional coaches supported by

state/what is being done to keep highly qualified teachers/safety guidelines district has
 5 - salary and if paid enough
 4 - what makes you consider leaving/are you interested in staying
 4 - how many years have you taught
 3 - mentors - should they be paid, how are they matched to mentees, format of mentoring program
 3 - how do you deal with stress, biggest frustrations,
 2 - what extra responsibilities are you given/extra curricular jobs
 2 - how effective do you feel you are as a teacher
 2 - classroom management
 2 - feelings on KPA
 2 - what a new teacher really needs
 2 - what universities could do differently to prepare future teachers in a more meaningful way/things colleges should add to truly prepare someone for teaching (state testing should be addresses)
 teach: how to better meet student needs, money & time spent outside of school, size of district, leadership opportunities for early career teachers, how does NCLB affect you, how can you get more resources, what planning time do we get

23. Where are you currently? District, grade level, school? 261 responses

67	#229 Blue Valley	4	#320 Wamego
28	#428 Great Bend/Riley	3	#351 Macksville
27	#253 Emporia	3	#503 Great Bend
24	#475 Geary County	3	#441 Sabetha/Wetmore
16	#383 Manhattan - Ogden	3	# 259 or 465 Wichita
13	#262 Valley Center	3	#506 Labette
11	#214 Ulysses	2	#307 Ell-Saline
9	#207 Fort Leavenworth	2	#379 Clay County
9	#363 Paola	2	#512 Shawnee Mission
4	#409 Atchinson County		
4	#250 Pittsburg		

1 #215 Lakin, 218 Elkhart, 254 Barber Co. N, 255 S. Barber Co., 257 Iola, 260 Derby, 291Grinnell, 292 Wheatland, 308 Hutchinson, 309 Nickerson, 339 Jeff Co. N, 340 Jeff West, 348 Baldwin City, 368 Paola, 377 Atchinson Public , 378 Riley County, 389 Hays, 396 Douglas, 410 Hillsboro, 416 Louisburg, 417 Morris Co., 418 McPherson, 442 Nemaha Co, 443 Dodge City , 445 Coffeyville, 474 Haviland, 489 Hays, 490 El Dorado, 493 Columbus, 497 Lawrence, 498 Valley Heights, 501 Topeka, 505 Chetopa, 511 Attica

Appendix B - Pilot Response Sheet

Don't worry about answers to any questions. Pretend that you are a new teacher so directions will make more sense. I will not be evaluating the answers and everything is anonymous. This paper, turned in on Friday, will count for 10 extra credit points if you have estimated time & have at least one comment on Email, Part 1,2,3,4 & 5. I'd like your input on directions that are unclear, grammar or spelling errors, suggestions for improvement, etc. Please estimate how long it takes you to take the survey. _____

EMAIL – Any suggestions for an email that would better encourage you to participate?

PART 1

1. Answer **1,2,or 3 years**. If you had taught 4 or more years would these directions make sense to you?
2. Answer **“yes.”** If you were not at K-6 teacher would these directions make sense to you?

PART 2

- 3.
- 4.
- 5.
- 6.
- 7.
8. Write something here, even just “hi”

PART 3

- 9.
- 10.
- 11.
- 12.
- 13.
14. Write something here please

PART 4

- 15.

16.

17.

18.

19.

20. Write something here please

PART 5 – just make up info for these 3 questions

21.

22.

23.

24. Write something here please

Appendix C - Explanatory Email for District Contacts

Emails had minor variations in content based on the contact to whom it was addressed. The following was the standard format:

I teach elementary math methods at Washburn University in Topeka and am also completing my doctoral work through Kansas State University. As part of my research I will be surveying 1st, 2nd and 3rd year elementary teachers from each district in Kansas. I am hoping to obtain information which will aid teachers of elementary math methods courses as we prepare teachers for your classrooms.

These teachers will receive a survey through Kansas State's Axio Survey System in late April or early May. It will, of course, be their choice whether or not to take the survey and the respondents will have complete anonymity. I have already received the names of teachers from several districts and hope that new teachers from your district can be represented in the results also. If you have any questions or require any further information, please email or phone me. I am providing my cell phone number as I will be out of my office a number of days in March - 620-340-9634.

If you do not need any further information, I would appreciate the names and email addresses of elementary teachers (this would include primary and intermediate school teachers also) who are in their 1st, 2nd, or 3rd year of teaching. I do not need names of those who do not teach math based content, physical education or music teachers for example. These names and email addresses will not be used in any way except to compile a base for this survey. Thanks so much for your time and for your timely response to this request. I am excited to learn from the opinions of those who have most recently experienced mathematics methods courses.

Lee Anne Coester
Washburn University
303 Carnegie
1700 SW College
Topeka, KS 66621

Appendix D - Email to Initial Group of Early Career Teachers

Subject: Opinions needed from fellow Kansas teachers

I was a classroom teacher in Kansas for 25 years and now teach Elementary Math Methods at Washburn University in Topeka. Do you feel that you were well prepared to teach math? Is so, why? If not, what suggestions would you have to improve elementary math methods courses? A contact person in your district has identified you as an early career elementary teacher and I value your opinion on these issues. I am hoping you will be willing to give 15-20 minutes of your end-of-the-year time to reflect via an online survey. It is completely anonymous and you can start, stop, and come back to the survey as needed. At the end of the survey you will have the opportunity to ask for a copy of the results. Your opinions can make a difference in future preparation of teachers. The survey will close on May 18). Thanks in advance, Lee Anne Coester

Appendix E - Survey Description, Opening Instructions, and Informed Consent

Survey Description

This survey is intended to answer three questions: 1.) What standards-based strategies do early career elementary teachers use in their math classrooms? 2.) What aspects of their math methods course(s) benefited them in using these strategies? 3.) What improvements in their math methods course(s) would provide for better preparation for the use of reform-based strategies?

This survey should take about 15 minutes and you may start and stop as needed. The survey will be closed on May 18. All responses are anonymous and, if you wish, you may request a copy of the results at the end of the survey. If you have any questions you may contact me at leeanne.coester@washburn.edu. Questions concerning credibility or validity may also be directed to my Kansas State doctoral advisor, Dr. David Allen or to the IRB Chair, Rick Scheidt (785-532-3224).

By clicking “NEXT” and completing the survey you are indicating that you understand that this survey is research and that participation is completely voluntary. You are also indicating that you understand that you may withdraw your consent at any time and stop participating without explanation or repercussion. Thank you so much for your support.
Lee Anne Coester

Opening Instructions

This survey has five sections. The 1st & 5th sections are very short – just demographic information. The 2nd asks what standards-based practices you currently use in your classroom. The 3rd part offers you the opportunity to choose what aspects of your methods course benefited you in teaching in a standards-based manner. The 4th asks for your ideas on ways to improve methods.

Standards-based practices are defined as those where student understanding is the main focus. The development of the processes of communication, connections, reasoning, representation, and problem solving is central. These five process make up the National Council of Teachers of Mathematics Process Standards.

Directions for each section appear at the beginning of the section. Questions 1 and 2 are marked “required” and must be answered before you are allowed to proceed. Otherwise you may skip a question then come back to it. A bar at the top of each page will help you determine your progress. Please proceed to the next screen to begin.

Appendix F - Email Reminder

Many have completed the survey on elementary math methods, but I haven't heard from you. The survey will only be open through May 18 and I do value YOUR opinion. I hope your school year is drawing to a pleasant close. Thanks again, Lee Anne Coester

**Appendix G - Survey – Listening to Early Career Teachers:
How Can Elementary Mathematics Methods Courses Better
Prepare Them to Utilize Standards-Based Practices in their
Classrooms?**



AXIO SURVEY

**Listening to Early Career Teachers: How Can
Elementary Mathematics Methods Courses
Better Prepare Them to Utilize Standards-Based
Practices in their Classrooms?**

Survey Description

This survey is intended to answer three questions: 1.) What standards-based practices do early career teachers use in their math classrooms? 2.) What aspects of their math methods course(s) benefited them in using these practices? 3.) What improvements in their math methods course(s) would provide for better preparation for the use of standards-based practices?

The survey should take about 15 minutes and you may start and stop as needed. The survey will be closed on May 18. All responses are anonymous and, if you wish, you may request a copy of the results at the end of the survey. If you have any questions you may contact me at leanne.coester@washburn.edu. Questions concerning credibility or validity may also be directed to my Kansas State doctoral advisor, Dr. David Allen or to the IRB Chair, Rick Scheidt (785-532-3224).

By clicking "NEXT" and completing the survey you are indicating that you understand that this survey is research and that participation is completely voluntary. You are also indicating that you understand that you may withdraw your consent at any time and stop participating without any explanation or repercussion. Thank you so much for your support. Lee Anne Coester

Opening Instructions

This survey has 5 sections. The 1st & 5th sections are very short - just demographic information. The 2nd asks what standards- based practices you currently use in your classroom. The 3rd part offers you the opportunity to choose what aspects of your methods course benefited you in teaching in a standards-based manner. The 4th asks for your ideas on ways to improve methods.

Standards-based practices are defined as those where student understanding is the main focus. The development of the processes of communication, connections, reasoning, representation and problem solving is central. These five processes make up the National Council of Teachers of Mathematics (NCTM) Process Standards.

Directions for each section appear at the beginning of the section. Questions 1&2 are marked "required" and must be answered before you are allowed to proceed. Otherwise you may skip a question then come back to it. A bar at the top of each page will help you determine your progress. Please proceed to the next screen to begin.

Page 1

This survey was intended for early career teachers in their first, second or third year of teaching.

Questions 1 & 2 will aid you in determining whether or not you should complete the survey. Both questions are required in order to proceed to the next page.

Question 1 ** required **

If your answer to question #1 is "4 or more" please answer question #2 then use the "next" buttons to skip to the end of the survey and close your browser.

How many years (including this year) have you been teaching (in any position or at any level)?

- 1 year
- 2 years
- 3 years
- 4 or more years - Please respond, answer question #2, then use the "next" buttons to skip to the end of the survey and close your

browser.

Page 2

If your answer to question #2 is "no," use the "next" buttons to skip to the end of the survey and close your browser. I am sorry you did not meet the qualifications for the survey, but appreciate your time. Thanks.

Question 2 ** required **

Are you currently teaching mathematics in some form (for example as a classroom teacher, a resource room teacher, a special education teacher, etc.) to students in any grade K-6?

Yes

No - Please respond then use the "next" buttons to skip to the end of the survey and close your browser. Thanks for your time.

Page 3

Questions 3-8 concern your use of **standards-based teaching practices** in your classroom. Standards-based practices are those based on the National Council of Teachers of Mathematics (NCTM) Process Standards of Communication, Connections, Reasoning, Representation and Problem Solving.

Each set of choices will apply to a different standard. Please note the standard above each question.

Make your choice based on an average week (5 days) of math lessons.

Question 3

NCTM states that students should "communicate to learn math" and "communicate mathematically." This set of questions applies to

NCTM's Communication Standard.

1 - Never used

- 2 - Rarely - 1 of 5 lessons
- 3 - Occasionally - 2 of 5 lessons
- 4 - Often - 3 of 5 lessons
- 5 - Very often - 4 of 5 lessons
- 6 - Nearly always - 5 of 5 lessons

	1	2	3	4	5	6
3.1 Students are encouraged to share/question mathematical ideas during whole class discussions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2 As students do activities, 'math talk' is encouraged between and among students.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3 Students express mathematical ideas and thoughts in writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4 Students communicate mathematical ideas symbolically via manipulatives, drawings, graphical representations, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 4

NCTM states that students should see the connections among mathematical topics and how mathematics relates to other subjects and to their own lives and experiences. This set of questions applies to

NCTM's Connections Standard.

- 1 - Never used
- 2 - Rarely - 1 of 5 lessons
- 3 - Occasionally - 2 of 5 lessons
- 4 - Often - 3 of 5 lessons
- 5 - Very often - 4 of 5 lessons
- 6 - Nearly always - 5 of 5 lessons

	1	2	3	4	5	6
4.1 Connections of the math concepts to real life phenomena are explored.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2 Connections of the math concepts to other classroom subjects (i.e. science or music) are explored.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3 Connections of the lesson's math concepts to other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

math concepts is explored.						
4.4 Students are encouraged to explore and describe mathematical connections.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 5

According to NCTM, reasoning involves "developing ideas, exploring phenomena, and justifying results." This set of questions applies to

NCTM's Reasoning Standard.

- 1 - Never used
- 2 - Rarely - 1 of 5 lessons
- 3 - Occasionally - 2 of 5 lessons
- 4 - Often - 3 of 5 lessons
- 5 - Very often - 4 of 5 lessons
- 6 - Nearly always - 5 of 5 lessons

	1	2	3	4	5	6
5.1 Students are required to justify and support solutions, opinions, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2 Students are encouraged to generate multiple or alternative solutions to problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3 Students are encouraged to question solutions, strategies, processes, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.4 Students are encouraged to estimate and determine if their answers are reasonable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 6

Representations can include, among other things, drawings, manipulatives, graphs, equations, charts, numerals, spread sheets, etc. This set of questions applies to

NCTM's Representation Standard.

- 1 - Never used

- 2 - Rarely - 1 of 5 lessons
- 3 - Occasionally - 2 of 5 lessons
- 4 - Often - 3 of 5 lessons
- 5 - Very often - 4 of 5 lessons
- 6 - Nearly always - 5 of 5 lessons

	1	2	3	4	5	6
6.1 Various representations (see examples above) of math concepts are presented by the teacher.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2 Students are encouraged to create and use various representations to explain math concepts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3 Students are encouraged to use various representations to solve problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.4 Students are encouraged to compare and contrast various representations of the same math concepts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 7

NCTM defines problem solving as "engaging in a task for which the solution method is not known in advance." This set of questions applies to

NCTM's Problem Solving Standard.

- 1 - Never used
- 2 - Rarely - 1 of 5 lessons
- 3 - Occasionally - 2 of 5 lessons
- 4 - Often - 3 of 5 lessons
- 5 - Very often - 4 of 5 lessons
- 6 - Nearly always - 5 of 5 lessons

	1	2	3	4	5	6
7.1 Understanding the concept (the whys, connections, appropriate representations, etc.) is the focus of the lesson.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.2 The teacher acts as a support and guide rather than a provider of a solution to the problem.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.3 Students are encouraged to use various strategies to solve problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7.4 The lesson's math concepts are learned in the context of problem solving (i.e. as students solve a real life problem, they learn the mathematical skills or concepts necessary to solve the problem.)

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Question 8

Please share any other comments that support or better explain your use of standards-based practices in your classroom.

If you have no additional comments, please proceed to the next page.

Characters Remaining:

Page 4

This section of the survey allows you to share aspects of your elementary math methods course **that benefited you in using standards-based practices** in your classroom.

The goals of methods are divided into 5 categories (*subject matter knowledge, knowledge of learners and learning, teaching skills, beliefs, and becoming a life long learner*). Each set of questions applies to a different category. **Please note which category is listed for each set of questions.**

Question 9

Knowledge of subject matter has been shown to benefit teachers in the use of standards-based practices in the classroom. Please indicate the degree to which each aspect of your methods course benefited you in

DEVELOPING AN UNDERSTANDING OF SUBJECT MATTER KNOWLEDGE FOR TEACHING.

- 1 - It was part of my course, but it DID NOT BENEFIT ME in developing my subject matter knowledge.
 2 - It was part of my course, but it WAS ONLY SOMEWHAT BENEFICIAL in developing my subject matter knowledge.
 3 - It was part of my course and it WAS BENEFICIAL in developing my subject matter knowledge.
 4 - It was part of my course and it WAS VERY BENEFICIAL in developing my subject matter knowledge.
 5 - We DID NOT DO THIS in my methods course.

	1	2	3	4	5
9.1 Presentations by the instructor with discussions and the opportunity for questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.2 Participating in activities (i.e. using manipulatives or playing games)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.3 Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.4 Teaching classmates OR Role playing OR Making presentations to the class (any or all of these).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.5 Reading and reflecting (i.e. the course text, journal articles, etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.6 Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.7 Observing in actual classrooms OR Working with a single student (either or both of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.8 Planning and teaching lessons in actual classrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 10

Understanding the students you teach - their level of development, their backgrounds, etc. - has been shown to benefit teachers in the use of standards-based practices. Please indicate the degree to which each aspect of your methods course benefited you in

DEVELOPING AN UNDERSTANDING OF LEARNERS AND LEARNING.

- 1 - It was part of my course, but it DID NOT BENEFIT ME in developing my subject matter knowledge.
 2 - It was part of my course, but it WAS ONLY SOMEWHAT BENEFICIAL in developing my subject

matter knowledge.

3 - It was part of my course and it WAS BENEFICIAL in developing my subject matter knowledge.

4 - It was part of my course and it WAS VERY BENEFICIAL in developing my subject matter knowledge.

5 - We DID NOT DO THIS in my methods course.

	1	2	3	4	5
10.1 Presentations by the instructor with discussions and the opportunity for questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.2 Participating in activities (i.e. using manipulatives or playing games)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.3 Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.4 Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.5 Reading and reflecting (i.e. the course text, journal articles, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.6 Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.7 Observing in actual classrooms OR Working with a single student (either or both of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.8 Planning and teaching lessons in actual classrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 11

In order to teach in a standards-based manner certain teaching skills are necessary. These skills might include, but are not limited to, using varying assessment techniques and teaching models, planning units, conferencing with students, evaluating teaching materials, or managing group work. Please indicate the degree to which each aspect of your methods course benefited you in

DEVELOPING AN UNDERSTANDING OF STANDARDS-BASED TEACHING STRATEGIES AND SKILLS

1 - It was part of my course, but it DID NOT BENEFIT ME in developing my subject matter knowledge.

2 - It was part of my course, but it WAS ONLY SOMEWHAT BENEFICIAL in developing my subject matter knowledge.

- 3 - It was part of my course and it WAS BENEFICIAL in developing my subject matter knowledge.
 4 - It was part of my course and it WAS VERY BENEFICIAL in developing my subject matter knowledge.
 5 - We DID NOT DO THIS in my methods course.

	1	2	3	4	5
11.1 Presentations by the instructor with discussions and the opportunity for questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.2 Participating in activities (i.e. using manipulatives or playing games)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.3 Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.4 Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.5 Reading and reflecting (i.e. the course text, journal articles, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.6 Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.7 Observing in actual classrooms OR Working with a single student (either or both of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.8 Planning and teaching lessons in actual classrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 12

One's beliefs about how students learn and the best teaching strategies have been shown to have a direct impact on a teacher's use -or not- of standards-based practices in the classroom. Please indicate the degree to which each aspect of your methods course benefited you in

ANALYZING YOUR BELIEFS AND DEVELOPING MORE POSITIVE IDEAS ABOUT STANDARDS-BASED TEACHING

- 1 - It was part of my course, but it DID NOT BENEFIT ME in developing my subject matter knowledge.
 2 - It was part of my course, but it WAS ONLY SOMEWHAT BENEFICIAL in developing my subject matter knowledge.
 3 - It was part of my course and it WAS BENEFICIAL in developing my subject matter knowledge.

4 - It was part of my course and it WAS VERY BENEFICIAL in developing my subject matter knowledge.
 5 - We DID NOT DO THIS in my methods course.

	1	2	3	4	5
12.1 Presentations by the instructor with discussion and the opportunity for questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.2 Participating in activities (i.e. using manipulatives or playing games)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.3 Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.4 Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.5 Reading and reflecting (i.e. the course text, journal article, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.6 Examining curriculum materials (i.e. NCTM & state standards, student texts, resource books)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.7 Observing in actual classrooms OR Working with a single student (either or both of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.8 Planning and teaching lessons in actual classrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 13

In order to successfully teach in a standards-based manner, a teacher must develop the desire to be a life-long learner. Teachers need to continually question, reflect, and study ways to improve their teaching. Please indicate the degree to which each aspect of your methods course benefited you in

DEVELOPING THE ATTITUDE OF A LIFE LONG LEARNER.

1 - It was part of my course, but it DID NOT BENEFIT ME in developing my subject matter knowledge.
 2 - It was part of my course, but it WAS ONLY SOMEWHAT BENEFICIAL in developing my subject matter knowledge.
 3 - It was part of my course and it WAS BENEFICIAL in developing my subject matter knowledge.
 4 - It was part of my course and it WAS VERY BENEFICIAL in developing my subject matter knowledge.
 5 - We DID NOT DO THIS in my methods course.

	1	2	3	4	5

13.1 Presentations by the instructor with discussions and the opportunity for questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.2 Participating in activities (i.e. using manipulatives or playing games)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.3 Viewing videos of teachers and students OR Discussing case studies OR Analyzing student work samples (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.4 Teaching classmates OR Role playing OR Making presentations to the class (any or all of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.5 Reading and reflecting (i.e. the course text, journal articles, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.6 Examining curriculum materials (i.e. NCTM & state standards, student texts, resource materials)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.7 Observing in actual classrooms OR Working with a single student (either or both of these)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.8 Planning and teaching lessons in actual classrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Question 14

What aspects of your elementary math methods course(s) had the greatest impact on your use of standards-based practices in your classroom?

You may want to name other aspects or further explain categories from above.

If you have no comments, please proceed to the next page.

Characters Remaining:

On each set of questions, please note to what degree each practice would improve the stated category. Please note that each question applies to a different category.

Question 15

Please rank your **TOP 3 CHOICES** according to how they might help you develop your **UNDERSTANDING OF SUBJECT MATTER KNOWLEDGE FOR TEACHING.**

- Have more open discussions and opportunities for questioning
- Have more opportunities to participate in activities (i.e. using manipulatives, playing games)
- View more videos of teachers and students AND/OR Discuss more case studies AND/OR Analyze more student work samples
- Do more teaching of classmates AND/OR Role playing AND/OR Presentations to the class
- Do more reading and reflecting (i.e. the course text, journal articles, etc.)
- Examine more curriculum materials (i.e. state standards, student texts, resource books)
- Do more observing in classrooms AND/OR Working with individual students
- Plan and teach more lessons in actual classrooms

Question 16

Please rank your **TOP 3 CHOICES** according to how they might help you to develop your **UNDERSTANDING OF LEARNERS AND LEARNING**

- Have more open discussions and opportunities for questioning
- Have more opportunities to participate in activities (i.e. using manipulatives, playing games)
- View more videos of teachers and students AND/OR Discuss more case studies AND/OR Analyze more student work samples
- Do more teaching of classmates AND/OR Role playing AND/OR Presentations to the class
- Do more reading and reflecting (i.e. the course text, journal articles, etc.)
- Examine more curriculum materials (i.e. state standards, student texts, resource books)
- Do more observing in classrooms AND/OR Working with individual students

Plan and teach more lessons in actual classrooms

Question 17

Please rank your **TOP 3 CHOICES** according to how they might help you to develop your **STANDARDS- BASED TEACHING STRATEGIES AND SKILLS**

- Have more open discussions and opportunities for questioning
- Have more opportunities to participate in activities (i.e. using manipulatives, playing games)
- View more videos of teachers and students AND/OR Discuss more case studies AND/OR Analyze more student work samples
- Do more teaching of classmates AND/OR Role playing AND/OR Presentations to the class
- Do more reading and reflecting (i.e. the course text, journal articles, etc.)
- Examine more curriculum materials (i.e. state standards, student texts, resource books)
- Do more observing in classrooms AND/OR Working with individual students
- Plan and teach more lessons in actual classrooms

Question 18

Please rank your **TOP 3 CHOICES** according to how they might help you to **ANALYZE YOUR BELIEFS AND DEVELOP MORE POSITIVE IDEAS ABOUT STANDARDS-BASED TEACHING**

- Have more open discussions and opportunities for questioning
- Have more opportunities to participate in activities (i.e. using manipulatives, playing games)
- View more videos of teachers and students AND/OR Discuss more case studies AND/OR Analyze more student work samples
- Do more teaching of classmates AND/OR Role playing AND/OR Presentations to the class
- Do more reading and reflecting (i.e. the course text, journal articles, etc.)
- Examine more curriculum materials (i.e. state standards, student texts, resource books)
- Do more observing in classrooms AND/OR Working with individual students

Plan and teach more lessons in actual classrooms

Question 19

Please rank your **TOP 3 CHOICES** according to how they might help you to develop your **ATTITUDE AS A LIFE-LONG LEARNER**

Have more open discussions and opportunities for questioning

Have more opportunities to participate in activities (i.e. using manipulatives, playing games)

View more videos of teachers and students AND/OR Discuss more case studies AND/OR Analyze more student work samples

Do more teaching of classmates AND/OR Role playing AND/OR Presentations to the class

Do more reading and reflecting (i.e. the course text, journal articles, etc.)

Examine more curriculum materials (i.e. state standards, student texts, resource books)

Do more observing in classrooms AND/OR Working with individual students

Plan and teach more lessons in actual classrooms

Question 20

To better prepare you to use standards-based practices in your classroom, what suggestion(s) would you make to improve elementary math methods course(s)?

You may want to name other aspects or further explain categories from above.

If you have no comments, please proceed to the last section.

Characters Remaining:

Three more easy questions and you are done!

Question 21

The NCTM Process Standards are those things that all students should be able to do as they do mathematics. The standards are communication, connections, reasoning, representations, and problem solving.

- The NCTM Process Standards were a CENTRAL FOCUS of my elementary math methods course(s).
- The NCTM Process Standards were a PARTIAL FOCUS of my elementary math methods course(s).
- The NCTM Process Standards were a MINOR FOCUS of my elementary math methods course(s).
- The NCTM Process Standards had NO FOCUS in my elementary math methods course(s).

Question 22

Please check your primary area of responsibility as a teacher for this year. If your time is split, mark as many choices as are necessary.

- classroom teacher - mainly self-contained
- classroom teacher - departmentalized
- interrelated, special education, resource room
- specialist, Title
- Other:

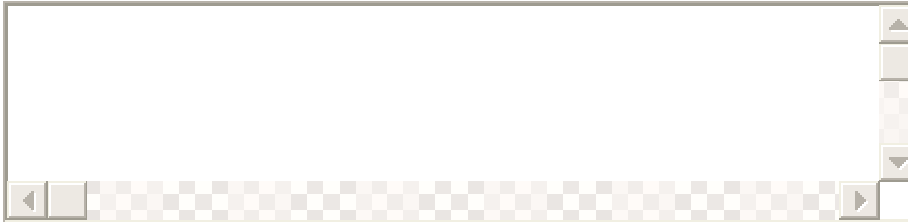
Question 23

Please mark the grade level for which you are most responsible. If your time is split or you work with multiple grade levels, mark as many as are necessary.

- Kindergarten
- First grade
- Second grade
- Third grade
- Fourth grade
- Fifth grade
- Sixth grade
- Other:

Question 24

If you have any final suggestions, questions or comments please share them here. If not, please proceed to the closing page.



Characters Remaining:

Closing Message

Thank you for taking the time to complete this survey! Your contribution is greatly appreciated. Your responses will be compiled with the rest of the survey responses and will provide information for improving elementary mathematics methods courses.

If you have any questions or would like a copy of the results please contact me at leanne.coester@washburn.edu.

- End of Survey -

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