ASSESSING PROBLEM SOLVING SKILLS AMONG PRE-SERVICE AND IN-SERVICE TEACHERS WITH REGARDS TO ACADEMIC SKILL DEFICITS

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Abstract: Given the importance of student academic success, it is imperative that teacher preparation programs ensure teachers-in-training, also called pre-service teachers, are being taught how to successfully identify and analyze the problems of struggling students. The purpose of the current study was to evaluate whether in-service and pre-service teachers differed in measured problem identification and analysis skills. In addition, the study sought to evaluate whether no instruction, didactic instruction, or didactic instruction plus modeling would result in the highest measured problem solving skills among participants. The results indicated in-service teachers possessed greater problem solving skills than pre-service teachers, and that didactic instruction plus modeling was the most effective form of instruction for teaching problem solving skills. No significant differences were found between the control and didactic instruction conditions. In addition, there was not a significant interaction between the independent variables. Implications for teacher preparation programs and for how to teach pre-service teachers problem solving skills are discussed, as well as suggestions for related future research.

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CHAPTER I

INTRODUCTION

Education in public schools is a continuously transforming domain. Every year, various teaching strategies regarding issues such as whether reinforcement is beneficial or detrimental to a child capture the attention of those in the profession of educating children. This is often due to the ever-evolving research that seeks to support or invalidate theories utilized in education. Another explanation for the continuous shifting of orientations is that a movement may gain momentum without empirical validity. The task of educating children is a vital component of the success of a nation and thus must be carried out with great knowledge and skill. A troubled country has a lesser chance of survival if it also fails to properly educate the children that will make up its future.

By the year 2020, the number of children and adolescents enrolled in the public education system is expected to reach 52.7 million (National Center for Education Statistics [NCES], 2011). According to the National Assessment for Educational Progress, which assesses students across the nation to track progress in education, the percentage of 12th Grade students at or above the proficient level in reading in 2009 was about thirty-eight percent and about twenty-six percent for mathematics (NCES, 2011). These statistics indicate that by the 12th Grade, a frighteningly large percentages of students remain at unacceptable performance levels in academics.

When examining the question of why more children are not experiencing higher rates of success within the education system, it is important to assess the training teachers have received. Unfortunately, little research exists regarding what specific skills a teacher's repertoire should include to help maximize student success (Cleven & Gutkin, 1988). The current data from the National Assessment for Educational Progress, however, suggests this is a critical area deserving of research due to the low percentage of students that are proficient in basic academics (NCES, 2011).

Research by Begeny and Martens (2006) found that undergraduate students training to become teachers, also called pre-service teachers, received more training in instructional strategies and principles than instructional programs and assessment strategies. This is concerning because in order for a teacher to know the progress a specific student is making, the teacher must first possess a skill set for assessing and monitoring a student's academic performance over time. Instead, it appears teachers' training focuses more on strategies, such as peer tutoring, and principles, such as reinforcement, than on how to best assess a student's actual knowledge of what he or she is being taught (Begeny & Martens, 2006).

In order to improve the education system, it is essential to examine the link between what pre-service teachers are being taught and what is actually occurring in the field. It would be naive to assume that a highly qualified teacher automatically equates to being an effective teacher. Current research suggests that pre-service teachers can possess skills that enable them to analyze classroom instruction strategies and to then collect evidence to support their effectiveness (Morris, 2006). Research has documented an obvious failure in the ability to generalize effective teaching strategies learned as a pre-service teacher and those actually employed as an in-service teacher (Scheeler, 2008). The deterioration of skills learned as a pre-service teacher may begin to emerge as early as the student teaching experience, suggesting that some significant knowledge of effective teaching strategies is lost even before graduation (Scheeler, Bruno, Grubb, & Seavey, 2009). This also has implications for children learning new material, suggesting that ineffective teachers may aid a child's low academic performance over time. How can we expect children to thrive academically if their own teachers cannot maintain and generalize knowledge of the use of effective teaching strategies?

A teacher must also possess a skill set that allows him or her to recognize when a student is failing to make adequate progress in the classroom and what needs to happen after such a student has been identified. This ability is often referred to as problem solving. The better a teacher's problem solving skills are, the more effective he or she is likely to be as a teacher (Begeny & Martens, 2006). The skills to be taught should include problem identification and problem analysis, which will then lead to successful identification of solutions and monitoring of progress toward a specific goal (Watson & Kramer, 1995).

An effective problem solving model should contain components for problem identification, problem analysis, intervention design and implementation, and progress monitoring (Ysseldyke & Martson, 1998). The problem solving process should be driven by empirically-based practices. Such a source of information will help ensure that a decision-making team is knowledgeable in determining when modifications to an intervention are necessary. A wait-to-fail model should have no place in an environment that is meant to foster student success. Instead, practitioners should seek to define what a problem is, why it is occurring, what needs to be done about it, and if the given solution has been effective at mediating the problem (Tilly III, 2002).

The steps of the problem solving process are straightforward and can be applied to problems of varying intensity, severity, and duration. The components of the model that must be altered as the dynamics of the problem change are the resources necessary and the intrusiveness of the tools and procedures used (Ysseldyke & Martson, 1998). While a minor problem may require a teacher to implement a simple intervention that does not require many resources, another more complicated and serious problem may require the involvement of multiple school professionals to successfully implement the problem solving process. With this in mind, it is of great importance that a problem is properly identified and analyzed before the proper solution can be utilized. Teachers can play a vital role in the problem solving process, especially during the problem identification and analysis phases. In the classroom, teachers have invaluable interactions with a child that can greatly aid in understanding a problem, what can be contributing to it, and any potential solutions. Teachers usually have the greatest amount of interactions with a child, and as such, they are the school personnel that usually refer students and will run an intervention once it's been proven effective.

When teaching problem solving skills to teachers, how the information is delivered is important. A notable obstacle is the overall lack of empirical evidence regarding the components of the consultative process for teaching problem solving skills that produce the best outcomes. The current knowledge of the process in the field has comes from inferences from information based on future referrals, self-reports, and other subjective measures (Cleven & Gutkin, 1988). One common instructional method used in teaching new skills is didactic instruction, which involves dispersing information through a lecture format. While didactic instruction is widely used, research has shown that overall the instructional method is ineffective (Ziarnik & Bernstein, 1982). Other methods, such as modeling, have proven more effective at teaching new skills (Cleven & Gutkin, 1988). Modeling becomes even more effective as an instructional method when it is combined with other methods, such as didactic instruction, and even more enhanced when a performance feedback component is added, which often increases the likelihood of the generalization of the newly taught skills across contexts (Watson & Kramer, 1995). Overall, research has shown that in order to develop a teacher's problem solving skills a simple verbal exchange is likely not sufficient to produce satisfactory results.

Not only do the issues discussed have serious implications for pre-service teachers and those already in the field, but they are also important for those responsible for training teachers. A trainer must first know how to teach problem solving skills to teachers before he or she can even attempt to do so. It is also important for a trainer to be aware of the impact problem solving skills can have on a student's success within the context of the classroom. The overall goal is to provide a skill set to teachers that will enable them to appropriately treat a student's academic struggles, and then to know how to treat similar academic deficits that arise in the future.

Research by Watson and Kramer (1995), indicated that training for pre-service teachers includes more courses on behavior management techniques than specific problem solving skills. If teachers are not being given enough instruction on how to identify and analyze a student's academic struggles, then how can they be expected to be successful (Watson & Kramer, 1995)? Watson and Kramer (1995) also found that many teacher training programs utilized didactic instruction as the main instructional method for teaching problem solving skills. According to research, the best methods of instruction require that teachers be told how to problem-solve, have it modeled for them, and then have them practice the skills with a component of performance feedback. Watson and Kramer (1995) note that regardless of what medium is used to teach problem solving skills, whether through video vignettes or verbal exchanges, the problem solving steps remain unchanged.

Given the importance of student academic success, it is imperative that research be conducted to further address the ability of teachers to utilize methodologies, like problem solving, to improve academic outcomes for students. The purpose of this study will be to evaluate the degree to which teachers possess basic problem solving skills and whether those skills can be improved by providing some form of relevant instruction. Therefore, this study seeks to answer the following questions. Do pre-service and in-service teachers differ with problem solving skills with regards to academic skill deficits? What instructional method will result in the greatest measured problem solving skills among participants? Lastly, is there an interaction between the variables instructional method and career status? It is hypothesized that in-service teachers will score higher on a measure of problem solving skills than pre-service teachers. In addition, a form of instruction that provides modeling will be superior in comparison to didactic instruction and receiving no instruction, and those that receive no instruction will score significantly lower than the other two instructional conditions. It is also hypothesized that there will be a significant interaction effect between the career status and instructional method variables.

CHAPTER II

REVIEW OF LITERATURE

The Link Between Teacher Skills and Student Success

Regardless of the importance of examining why more children are not experiencing higher rates of success within the education system, little research exists regarding what specific skills a teacher's repertoire should include (Cleven & Gutkin, 1988). In order for a teacher to know the progress a specific student is making, the teacher must first possess a skill set for assessing and monitoring a student's academic performance over time. Instead, it appears teachers' training focuses more on strategies, such as peer tutoring, and principles, such as reinforcement, than on how to best assess a student's actual knowledge of what he or she is being taught (Begeny & Martens, 2006).

It would be naive to assume that a highly qualified teacher automatically equates to being an effective teacher. Current research suggests that pre-service teachers can possess skills that enable them to analyze classroom instruction strategies and to then collect evidence to support their effectiveness (Morris, 2006). However, the documented deterioration of skills learned as a pre-service teacher suggests that some significant knowledge of effective teaching strategies is lost even before graduation (Scheeler et al., 2009). This also has implications for children learning new material, suggesting that ineffective teachers may aid a child's low academic performance over time.

Theories of effective teaching

It would be naive to assume that a highly qualified teacher automatically equates to being an effective teacher. Ineffective teachers have the potential to greatly contribute to a child's poor academic performance. At the same time, a highly effective teacher can positively affect a child's academic success. The value of the teaching profession is in part determined by the results brought by those in the profession (Carpenter, 1900). If the field is overwhelmed with ineffective teachers who do not help children succeed, then we can expect teachers to be devalued.

The differentiation between effective and ineffective teaching strategies is not always readily discernible. In 1994, Ellis, Worthington, and Larkin produced a technical report for the National Center to Improve the Tools of Educators that outlined ten teaching principles demonstrated as effective by research. The results of the research synthesis by Ellis et al. (1994) described effective teachers as ones that encourage students to be actively engaged during instructional activities. In addition, effective teachers provide increased opportunities to learn, which is most often implemented using large or whole group instruction. Effective teachers also encourage students to become self-regulated learners by carefully scaffolding instruction (Ellis et al., 1994).

Teachers should also foster learning through helping students organize, store, and retrieve knowledge by using semantic features analyses, study guides, organizers, anchored instruction, and semantic mapping (Ellis et al., 1994). Strategic instruction should also be used by teachers to allow students to use existing knowledge in such a way that will enable them to learn new material, and should include scaffolding, monitoring, and evaluation. Instruction should be explicit and utilize goals, objectives, expectations, lesson structures, presentations, and instructional content that will allow students to become self-regulated learners (Ellis et al., 1994).

The terms used to describe an effective teacher are more congruent with how a qualified teacher is described, which is as someone who has a bachelor's degree and full certification in the state he or she teaches (Brown, Morehead, & Smith, 2008). The criteria used to describe effective teachers make no mention of their instructional strategies or behavior modification techniques, among other things. Instead, the terms used merely describe if a teacher has completed the minimum requirements in order to become a teacher.

A common question that arises when discussing theories of effective teaching is if teacher qualifications really have an impact on student success. Research has revealed that the answer to the question is that certain teacher qualifications can indeed impact student success (Croninger, King Rice, Rathburn, & Nishio, 2004). For example, teachers with degrees in elementary education and who have two or more years of experience as a first grade teacher are associated with students with higher achievement in reading than teachers who do not hold those qualifications (Croninger et al., 2004).

Thirty years ago, it was thought that the only necessary characteristic a teacher needed in order to be effective was that he or she liked children (as cited in Brown et al., 2008). More recently, observations of teachers with high-performing students reveal that effective teachers often utilize direct instruction and are respectful but yet demanding of their students (Poplin & Soto-Hinman, 2006). It appears that to be effective, teachers must do much more than just like the population they work with.

While our country has seen an outpouring of policies enacted to promote higher quality standards for teachers, there has been a notable lack of agreement on how to recognize effective teaching (Kane, Taylor, Tyler, & Wooten, 2010). Some school districts across the country are beginning to use student achievement as a direct measure of the effectiveness of a teacher, while others purely use classroom observations (Kane et al., 2010). Among the issues that have risen with using student achievement gains as measures of teacher effectiveness is that using test-based measures of student achievement does not inform administrators of how to improve teaching practices (Kane et al., 2010).

Similar to college entrance exams, using test-based measures of student success may only demonstrate the areas a student is lacking proficiency in, but does not offer guidance for how to improve the teaching practices that may have led to such academic skill deficits. This basic lack of information about effective teaching could potentially lead teachers to focus more on teaching students how to successfully take state tests rather than about vital content in the curricula. If, somehow, student achievement gains on state tests were a reliable and valid measure of teacher effectiveness, the practice still wouldn't inform administrators about how to replicate such teachers (Kane et al., 2010). It becomes evident that identifying effective teachers is not enough to inform teacher practices.

It is easy for those not in the teaching profession to criticize the practices of those that are in the profession. Being a teacher can be a very demanding job, both emotionally and physically. They must plan, implement, and monitor practices that were put in place to enhance student achievement. Teachers must also incorporate the demands of their district and state, which can be a confusing and overwhelming task (Danielson, 2007). District or state frameworks for teaching can be a source of relief for teachers, especially those new to the field, because they make expectations and guidelines more straightforward. Essentially, frameworks outline best practices for those in the field and can be easily understood by novice and veteran teachers. It is important to note that simply using any framework for teaching will most likely not be enough to produce effective teachers. These frameworks should be developed based on research that identifies best practices related to improving student achievement.

Numerous frameworks for teaching have evolved in an effort to promote effective teaching practices. A prominent framework developed by Danielson (2007), outlines four domains with a total of twenty-two components that define best practices of teachers. Domain One, titled Planning and Preparation, states that teachers should be able to demonstrate their knowledge of content, students, and resources, as well as set instructional outcomes, and design coherent instruction and student assessments. When designing student assessments, teachers should make them so that they are congruent with instructional outcomes and are useful for instruction planning purposes. Domain Two, titled The Classroom Environment, states teachers should be able to create an environment of respect and rapport, establish a culture for learning, manage classroom procedures, and manage student behavior and the organization of physical space. A component of Domain Two that is of importance is the expectation that teachers properly monitor and respond to misbehaviors in the classroom (Danielson, 2007).

Domain Three of the framework, titled Instruction, states teachers should communicate with students, use questioning and discussion techniques, engage students in learning, use assessments in instruction, and demonstrate flexibility and responsiveness in the classroom (Danielson, 2007). Essentially, teachers should ensure student participation and monitor student learning. The last domain, Domain Four, titled Professional Responsibilities, says teachers should reflect on their teaching, maintain accurate records, communicate with students' families, participate in a professional community, ensure professional growth, and show professionalism. Of importance here is that teachers should reflect on their own teaching skills so they can ensure information is being taught accurately. They should also be able to improve their teaching methods if found unsatisfactory (Danielson, 2007).

Current Training Programs for Teachers

In 2004, The Teaching Commission, which is a group of education, business, and government leaders, published a call to action with policy recommendations built in part to ensure teachers continue to strive for excellence in the field. The commission stated that over the next ten years, at least two million new teachers will need to be hired across the country. How will the field successfully fill these positions as states continue to redefine what an effective, quality teacher is? The report by The Teaching Commission (2004), suggests that as a country, we have set low standards for teacher preparation and licensure. Do we then blame teachers or the institutions that trained them for the low performance of students? The answer doesn't appear to be clear-cut.

In 2010, the National Commission on Teaching and America's Future (NCTAF) published a research report about the current teacher workforce and its implications. The study found that nearly half of current teachers are approaching the age for retirement (NCTAF, 2010). In contrast with the data published by The Teaching Commission (2004), the NCTAF (2010) cites studies estimating that anywhere between almost three million and five million new teachers will need to be hired by the year 2020. The NCTAF (2010) also states that the attrition rate among new teachers has continued to worsen over the last fifteen years. The looming loss of a large amount of veteran teachers and the already occurring loss of newly hired teachers has the potential to create a workforce with little experience (NCTAF, 2010). With this in mind, it is no surprise that universities and school districts across the country are scrambling to train and find highly qualified teachers.

Research has documented an effect of a teacher's years of experience on the achievement of students (NCTAF, 2010). In 1996, the NCTAF published a report with proposals for preparing and supporting teachers across the country. According to the report, almost twelve percent of new teachers are hired even when they lack any training, and about fourteen percent are hired without fully meeting state standards (NCTAF, 1996). Someone cannot be hired as a plumber or a hair stylist without successfully completing the required training and passing a formal examination, but in almost every state someone can be hired as a teacher even if they have failed to meet the position's basic requirements. The matter becomes even more complicated in poor school districts, in which there has been high teacher turnover and lax hiring policies (NCTAF, 1996).

Researchers have long been looking for the answer for how to prepare pre-service teachers to become successful, effective teachers in the field. Instead of being able to identify what works, research seems to be more capable of identifying problems with teacher preparation programs. For example, the NCTAF (1996) identified issues such as inadequate length of time of preparation, stating that four years in an undergraduate program is insufficient to produce quality teachers. Other issues in teacher preparation programs include fragmentation of key parts of teacher learning, uninspired teaching methods, a lack of instruction on how to handle actual problems of practice, and a lack of learning how to collaborate (NCTAF, 1996). The Teaching Commission (2004) called on universities to raise the standards for allowing someone to enter a preparation program, as well as ensuring a connection is made to practicing in the real world. The Teaching Commission (2004) also recommended that universities require students majoring in education to receive a minor in an academic subject, like math, and for faculty to teach practices that have empirical support.

Practices pre-service teachers should be taught include instructional interventions that are empirically supported, the purposes of research in education and how to evaluate it, and how to communicate knowledge with other practitioners (Greenwood & Mabeady, 2001). Without this knowledge, new teachers may fall victim to practices that do not improve student performance, or worse, hurt student performance. In order to implement research-based practices, teacher preparation programs should demand students to reference research when making decisions about instruction. Programs should also teach students how to find relevant literature as well as how to interpret and analyze research findings (Greenwood & Mabeady, 2001). Essentially, pre-service teachers should be able to translate research into practice once in the field.

Even when an institution enacts the basic procedures to prepare teachers for their career, there are still noticeable differences between what some are being taught to do and what they're actually doing once in the field (Scheeler et al., 2009). The completion of coursework and student teaching requirements does not necessarily equate to the maintenance and generalization of the teaching skills learned as an undergraduate. In some cases, thirty percent or less of the skills pre-service teachers learn will actually be used once they are in-service teachers (Englemann, 1988). Where is the missing link between the skills being taught to pre-service teachers and the skills being used by new teachers? A research synthesis by Scheeler (2008) revealed four factors that may help teachers sustain the skills taught to them in college. The factors include immediate feedback when teaching new skills, training to mastery, programming for generalization, and providing pre-service teachers with feedback in applicable settings (as cited in Scheeler et al., 2009). Ideally, these procedures would be incorporated into all training programs and would be implemented by properly trained supervisors.

Research has documented a deterioration of skills from undergraduate courses to student teaching, which is highly alarming (Scheeler et al., 2009). This implies pre-service teachers begin to lose newly acquired skills before they graduate and enter the field. How can teachers be successful if they began losing knowledge they gained before they even received their degree? Obviously, more must be done to ensure pre-service teachers not only maintain what they are taught, but can also generalize the knowledge across settings. This issue in pre-service teacher training not only affects the teacher, but also affects the children he or she will eventually be teaching.

Instructional Methods

When teaching new material to someone, how the information is delivered is an important factor in how much that person learns. One common instructional method used in teaching new skills is didactic instruction, which involves dispersing information through a lecture format. While didactic instruction is widely used, research has shown the instructional method to be overall ineffective (Ziarnik & Bernstein, 1982). Other methods, such as modeling, have proven more effective at teaching new skills (Cleven & Gutkin, 1988). Modeling becomes even more effective as an instructional method when it is combined with other methods, such as didactic instruction, and even more enhanced when a performance feedback component is added, which often increases the likelihood of the generalization of the newly taught skills across contexts (Watson & Kramer, 1995).

Didactic Instruction.

Didactic instruction is the teacher-centered presentation of material that requires the student to assume the role of a passive learner (Smerdon, Burkam, & Lee, 1999). The method has in large part been proven ineffective in comparison to active methods of instruction, such as modeling (Graham & Wong, 1993; Sterling-Turner, Watson, Wildmon, Watkins, & Little, 2001; Neef et al., 2004). Despite this knowledge, didactic instruction continues to play a prominent role in education (Omelicheva & Avdeyeva, 2008). The instruction method appears to be useful in educating someone in the basic knowledge of a particular subject (Omelicheva & Avdeyeva, 2008) rather than how to apply such knowledge.

When reviewing the effectiveness of didactic instruction, the analyst should envision an elementary school classroom that contains thirty students and one teacher. The teacher is lecturing the entire class about how clouds are formed. How likely is it that all thirty students are actively engaged for the entire duration of the lecture? The format of didactic instruction does not allow a teacher to check that every student is grasping the material being covered. This problem is even more compounded by larger classrooms, like at universities where sometimes hundreds of students are in attendance.

A review of the literature regarding the effectiveness of didactic instruction found that the teaching method was as effective as other methods were for delivering content information (Bligh, 2000). The criteria for evaluating effectiveness were that students demonstrated acquisition of information. However, it is important to note that this review of research did not demonstrate that didactic instruction was more effective than any other teaching method at ensuring student acquisition of knowledge (Bligh, 2000).

A potential strength of the didactic method of instruction is that it can be utilized almost anywhere, as it requires few resources, unlike what might be necessary for a practicing component of modeling with rehearsal feedback. It can also be applied with almost any content area, as almost all that is required is simply a source of information from which to draw lecture materials from (Broadwell, 1980). Didactic instruction is also efficient in that a teacher simply needs to present information and move on to new material without necessarily checking for mastery of the information from his or her pupils. The instruction method can be effective when a teacher makes an effort to connect the lecture content to related student activities (Chaudhury, 2011). Teachers can also include a carefully structured process of questioning students during lectures to allow students the chance to correct any misunderstandings they may have of the material (Chaudhury, 2011).

Didactic instruction, when used as the main method of teaching in a classroom, has the potential to harm student attitudes toward the material covered in class (Bligh, 2000). If students feel as though their success in the mastery of material covered during lectures is not valued, which could arguably be demonstrated in this teacher-centered approach, then it is reasonable to assume students may not value their own mastery of the content knowledge.

Modeling Instruction.

Another method for relaying information is through modeling, which is a more student-centered approach than didactic modeling. This teaching method creates visible representations of information presented, such as the key properties of written language (Martin, 1999). Listening to a lecture about the features of written language is probably not as effective as actually being able to see the information come to life with examples. In regards to teachers, how can we expect teachers to teach others about issues such as proper error correction methods if they have never seen it in action themselves? The ability to describe something does not automatically equate to being able to actually correctly perform the task related to the content knowledge.

When someone is being taught through modeling, it is the teacher's responsibility to help that person understand what is being relayed through visible examples of applications of the material (Goslin, 2012). Modeling should be viewed as a form of communication that is strategic (Goslin, 2012). As such, this instructional method may be more time-consuming than didactic instruction alone. It engages the learner and gives the opportunity to see the relationship between a strategy and the use of it (Neef et al., 2004). A weakness of modeling instruction, and potentially a weakness of all instructional strategies, is that observation of a strategy does not necessarily mean observers have learned the strategy or will be able to carry it out independently (Rosen et al., 2010).

When exploring various research studies that have modeling included in an independent variable, it is obvious that the term is loosely applied in numerous situations. The term has been used interchangeably with observational learning and imitation, which are separate and distinct terms (Rachman, 1972). Instead, modeling should be considered as a form of social imitation rather than as being synonymous with observational learning and imitation (Rachman, 1972). Not only does modeling aid in the elimination of unwanted behaviors, but it also aids in the development of desired behaviors.

If taking students to a live setting to observe something like child behavior is not possible, then modeling can serve as a means for demonstrating information without needing to leave the classroom (Henderlong Corpus & O'Donnell Eisbach, 2005). In other words, modeling can demonstrate information without taking learners to the environment in which the knowledge will be applied. It can also foster the connection between prior knowledge. However, this connection can be harmed if the teacher does not practice what they teach (Higgs & McMillan, 2006). This applies to professors teaching pre-service teachers, and to in-service teachers teaching children. For example, if a professor is teaching pre-service teachers about using a variety of instructional methods, and the professor only uses didactic instruction in his or her course, then this could harm the connections the pre-service teachers are making between what they're being taught to do, and how they're being taught to do it.

Modeling has been demonstrated to increase social skills, such as eye contact (Edelstein & Eisler, 1976) and sharing (Elliott & Vasta, 1970), and fear of particular stimuli, such as snakes (as cited in Rachman, 1972). Elliott and Vasta (1970) note that the addition of explanations while modeling can make clear the nature of the desired response as well as emphasizes this by eliciting rehearsal of what is to be done or what has been demonstrated. The effects of modeling can also be enhanced by adding reinforcement and feedback for the learner (Elliott & Vasta, 1970; Edelstein & Eisler, 1976). However, research by Watson and Kramer (1995) found contradictory results with regards to the enhanced effects of modeling when paired with feedback. The researchers found that while modeling was more effective than didactic instruction was for increasing subjects' problem identification and analysis skills, modeling with feedback was no more effective than modeling alone (Watson & Kramer, 1995).

Problem Solving Skills

The approach to problem solving in education has shifted from a philosophical one to a more scientific one (Tilly III, 2002). Instead of relying on philosophical reasoning and assumptions, the field now attempts to rely on empirically-based practices that involve a particular process for problem solving. Teachers ideally have the goal in mind to see every child succeed. If research does not support a particular practice, then it is only logical that a teacher should not adopt the same practice in the classroom.

An effective problem solving model should contain components for problem identification, problem analysis, intervention design and implementation, and continuous progress monitoring (Ysseldyke & Martson, 1998). The problem solving process should be driven by empirically-based practices. Such sources of information will help ensure that a decision-making team is knowledgeable in knowing when modifications to an intervention are necessary. A wait-to-fail model should have no place in an environment that is meant to foster student success. Instead, practitioners should seek what a problem is, why it is occurring, what needs to be done about it, and if the given solution has been effective at mediating the problem (Tilly III, 2002).

The problem solving process is easy to understand and can be applied to problems of varying intensity, severity, and duration (Ysseldyke & Martson, 1998). The components of the model that must be altered as the dynamics of the problem change are the resources necessary and the intrusiveness of the tools and procedures used (Ysseldyke & Martson, 1998). While a minor problem may require a teacher to implement an unobtrusive, simple intervention, another more complicated and serious problem may require the involvement of multiple school professionals to successfully implement the problem solving process. With this in mind, it is of great importance that a problem is properly identified and analyzed before the proper solution can be utilized.

Teachers can play a vital role in the problem solving process, especially during the problem identification and analysis phases. In the classroom, teachers have invaluable interactions with a child that can greatly help a school psychologist understand a problem, what can be contributing to it, and any potential solutions. Teachers usually have the greatest amount of interactions with a child, and as such, they are the school personnel that usually refer students and will run an intervention once a school psychologist has proven its effectiveness.

Problem Identification.

The problem identification phase seeks to find if there is a legitimate problem present, and if so, what that particular problem is. During this phase, all relevant information is considered in order to objectively and operationally define the presenting problem. This is done by identifying what the student is expected to be doing and what the student is actually doing (Tilly, 2008). According to the best practices put forth by NASP, the difference between what a student should be doing and what he or she is not doing is the representation of the presenting problem (Tilly, 2008). In order to evaluate what level a student should be performing at, it is necessary to have normative data. This can be done by testing a student's classroom peers in the area the student is lacking, like multiplication facts. Some school districts regularly collect benchmark data on all their students, which can be a source of data.

The discrepancy identified can take many forms, such as a percentage of homework completion or on-task behavior (Tilly, 2008). Identifying problems in the form of discrepancies is advantageous because it causes the examiner to be objective about the problem (Tilly, 2008). It also allows the examiner to interpret the magnitude of a problem (Tilly, 2008). For example, the larger the discrepancy between the expected percentage of homework completion and the actual percentage of homework completion by a student the more severe the problem is. If a student's peers are turning in ninety five percent of their work and the student in question is turning in only twenty-five percent of his work, then the correct problem identification is rate of homework completion.

With the passage of the No Child Left Behind Act, schools across the nation regularly collect school-wide data about students' proficiency in critical skills areas (Tilly, 2008). While this data allows school personnel to identify children with deficits in certain areas, it does not allow teachers and administrators to identify why a child is struggling in a particular area (Tilly, 2008). With this information in mind, it becomes clear why it is crucial that a thorough and objective process for identifying a student's problems exists.

Problem Analysis.

The next stage of the problem solving model is problem analysis. During this stage, the data collected during the problem identification stage lends to the analysis of why a problem is occurring. The problem identification phase can greatly affect how a problem is analyzed (Bergan, 1995). Was the problem defined in terms of an issue that is within-child, meaning it is the result of a characteristic of that child that cannot be changed? If the answer is yes, then the outcome of the problem analysis phase will likely lead the analyzer to conclude that the child cannot be helped. This view of the problem takes the responsibility of the problem off the teacher, which is not necessarily what will help the child. It becomes evident how crucial proper problem identification is to problem analysis, as well as to the outcome of the entire problem solving process.

While problem identification seeks to answer if there is a problem present and what it is, problem analysis tries to find why the problem is occurring. A goal of problem analysis is to gather sufficient information to aid in identifying appropriate remedies. This is typically accomplished by creating hypotheses that link the observed performance to its presumed causes (Tilly III, 2008). Successful problem analysis should lead to the definition of a target for performance as well as an intervention, which will depend on whether the problem is a skill or performance deficit and whether it is an academic or behavior concern.

A critical component of problem analysis is the use of assessments to further analyze the presenting problem. Is the problem occurring because of teacher variables, such as poor classroom management, or educational history, such as a lack of instruction? Appropriate assessments enable the testing of hypotheses about the problem. In general, the more inference used in the analysis of a problem, the less someone can be certain about the effectiveness of the chosen intervention (Tilly III, 2008).

It essential that the person carrying out the problem analysis phase has knowledge in the domain the child is presenting a problem (Tilly III, 2008). If someone is unfamiliar with what composes the ability to read, then he or she is most likely a poor fit for analyzing such a problem. Such a poor fit between the analyzer and the presenting problem could lead to the use of inappropriate assessments, which can be a waste of resources. It can also lead to inappropriate methods being chosen to remediate the presenting problem.

Teacher Problem Solving Skills.

The education field has seen an overwhelming lack of research regarding how problem solving skills should be taught to pre-service teachers and whether or not teachers possess these upon graduating (Watson & Kramer, 1995). However, because teaching can be viewed as a problem solving process that is ongoing (as cited in Watson & Kramer, 1995), teachers who have effective problem solving skills are likely more effective teachers than those who do not have effective problem solving skills (Watson & Kramer, 1995). This can be considered a valid reason for ensuring teachers are taught effective problem solving skills early in their career.

When researching problem solving skills of teachers, it becomes apparent that the problem solving process normally takes place within consultant-consultee or other team interactions (Bergan, 1995). Pre-service training programs may discuss problem solving skills in their courses, but the role of teachers as the primary problem solver for academic deficits is rare. Within schools, much of the process seems to be guided by skilled consultants rather than teachers alone (Cleven & Gutkin, 1988; Bergan, 1995; Tilly III, 2008). Perhaps a better allocation of resources would have teachers play the primary role in analyzing and identifying problems in their own classrooms.

Pre-service teachers should be taught problem solving skills by an individual highly skilled in the application of problem solving skills. Research has shown that highly skilled consultants were more effective at improving teachers' problem clarification skills than were low-skilled consultants (Curtis & Watson, 1980). This requirement of a highly-skilled instructor should apply to faculty members teaching pre-service teachers how to problem solve. In order for pre-service teachers to develop problem solving skills before they graduate, it may be essential that their problem solving skills training is delivered by a faculty member highly skilled in the area.

When the problem solving method began to be implemented in schools, the majority of teachers and administrators working in schools were not trained in the use of the model (Tilly III, 2008). This created a framework within which outside specialists, otherwise known as consultants, would come into schools to provide services for those referred. The problem solving model was implemented mostly with moderate to severe problems and was not used as early intervention for developing issues. With this knowledge, it is apparent that pre-service teacher education programs still on consultant-driven means of employing the problem solving method in schools.

Allen and Blackston (2003) investigated how pre-service teachers respond to being trained in collaborative problem solving. The pre-service teachers included in the study were required to develop scripts for interventions, and their adherence to different scripts was measured. The researchers found that when teachers collaboratively problem-solved, they were more likely to adhere to intervention plans. They also showed more improvement in their client's performance in relation to the student behavior targeted by the intervention (Allen & Blackston, 2003). Essentially, teachers can be taught to collaboratively problem-solve, which will most likely affect student outcomes. If teachers can be taught to problem-solve within the contexts of a group, then one would hope that this skill would generalize to solitary problem solving. However, the education system should not rely on hoping teachers will be able to problem-solve independently, and should instead ensure teachers' are being taught such skills while still in their undergraduate career.

Teachers can play a vital role in the problem solving process, especially during the problem identification and analysis phases. In the classroom, teachers have invaluable interactions with a child that can greatly aid in understanding a problem, what can be contributing to it, and any potential solutions. However, research by Watson and Kramer (1995) indicated that training for pre-service teachers includes more courses on behavior management techniques than specific problem solving skills. If teachers are not being given enough instruction on how to identify and analyze a student's academic struggles, then it may be unrealistic that they be expected to be successful (Watson & Kramer, 1995)?

CHAPTER III

METHODOLOGY

Study Variables

Independent Variables.

Two independent variables were utilized for this study and included career status and instructional method. For career status, the groups included pre-service teachers and in-service teachers. Pre-service teachers were defined as undergraduate students in an elementary education program. In-Service teachers were defined as individuals with experience as elementary education teachers. The independent variable instructional method included three groups, which were a control condition, didactic instruction, and didactic instruction plus modeling. Participants in the control condition did not receive any problem solving skills instruction.

Dependent Variable.

The dependent variable was problem-solving skills as measured by a composite score on a questionnaire. Participants' responses on the Problem Identification and Analysis

Questionnaire (PIAQ) were evaluated to create an overall composite score for each participant. The higher the composite score a participant received, the more problem skills a participant had. The questionnaire allowed the researcher to evaluate participants' problem solving skills after receiving some form of instructional treatment.

Research Design

The study utilized a two-factor between-subjects design. Participants were randomly assigned to one of three instructional groups, which included a control condition, didactic instruction, and didactic instruction plus modeling. The numbers of participants per instructional and career status group were roughly equal. Participants were not told the complete purpose of the study until after they completed it. The study took place online utilizing Qualtrics, a website for designing and hosting survey research. All participants were able to access the study through a link to Qualtrics and did not appear in person to complete the study. The nature of Qualtrics allowed for a specialized survey flow and randomization, which allowed for control over what material was seen and when by participants. In addition, participation in the study was completely anonymous.

Participants

Participants were selected from one university in the northeastern portion of the state of Oklahoma as well as school districts served by an area education agency in central Iowa. Pre-service teachers included individuals that were juniors in a bachelor's degree program for elementary education and who had not yet completed student teaching. Undergraduate students who were seniors were not included in the study due to the fact that classroom observations and student teaching occur during elementary education students' senior year, and the researchers wanted to reduce any biases such experiences could create. In-service teachers were required to meet the following criteria: a) individuals were either pursuing a master's degree in education or were current teachers in an area education agency in Iowa; b) did not possess alternative certification to teach; c) held at least a bachelor's degree in elementary education; d) had at least one year of teaching experience; and e) were general education staff. Special Education teachers, administrative staff, and other faculty, such as Speech Language Pathologists and Occupational Therapists, were not solicited to participate in the study due to their unique and specialized knowledge.

A total of 1,695 individuals were recruited to participate in the study through four separate recruitment emails. Those recruited included undergraduate students (*n*=304), graduate students (*n* =359), and teachers served by an area education agency in Iowa (*n* =1,082). The response rate for obtaining participants was 2%. All participants were recruited through email, while university students were also recruited through flyers and an online research system that gives university students extra credit in classes for research participation. Faculty members involved in classes that potential participants were enrolled in were also consulted. Two faculty members presented the study to multiple classes and encouraged participation, and this significantly increased the number of undergraduate students that participated. The population of teachers working in Iowa was not originally included in the study and was added when it was evident there would be difficulty recruiting graduate students with teaching experience.

Participant demographics are summarized in Table 1. A total of 15 pre-service teachers and 17 in-service teachers participated in the study. The 17 participants in the in-service group ranged in age from 25 to 61 years old (M = 44.41, SD = 12.15). All in-service participants indicated their primary language was English, that they were General Education teachers who were fully certified to teach in elementary education, and that they held at least a bachelor's degree in elementary education. The years of experience of in-service participants ranged from 3 to 38 years (M = 18.26, SD = 11.07). The 15 participants in the pre-service group ranged in age from 19 to 31 years old (M = 22.07, SD = 3.24). All pre-service participants indicated their primary language was English, that they had not yet completed student teaching and were juniors in an elementary education degree program, and that they did not already hold a bachelor's degree. The number of courses participants indicated they had taken related to their major ranged from 5 to 21 (M = 13.53, SD = 4.91).

Materials

Demographic Surveys.

A brief demographic survey was given to all participants. The content of the demographic survey differed according to whether a participant was a pre-service or an in-service teacher (see Appendices A and B). In addition, because a researcher could not be present to ensure participants met criteria before beginning the study, some of the questions were used to terminate a participant's session if s/he indicated on a demographic survey question that s/he did not meet any of the participation criteria. The questions all participants saw, regardless of career status, included: a) age, b) primary language, and c) gender. Demographic questions specific to the pre-service teachers included: a) current classification (i.e., year in college), b) current major, c) intended grade once a teacher, d) any previously awarded undergraduate degrees, and if so, in what area e) the number of courses taken related to degree, and, f) whether student teaching had already been completed. The demographic survey questions specific to in-service teachers included: a) years of experience as a teacher, b) primary grade taught, c) highest degree awarded, d) if a current certification was held to teach, and if so, in what area, e) if enrolled in a master's of education degree program, f) if a current teacher served by an area education agency in Iowa, g) if currently a general education teacher, and, h) if a bachelor's degree in elementary education was held.

Problem Identification and Analysis Questionnaire.

The questionnaire used to measure problem solving skills was a modified combination of the Problem Identification Questionnaire (PIQ) and Problem Analysis Questionnaire (PAQ) developed by Watson (1991). The questionnaire utilized for this study was called the Problem Identification and Analysis Questionnaire (PIAQ), (see Appendix C). The PIAQ was presented to participants after they completed the instructional component of the study. After reading a vignette about a child struggling with an oral reading fluency skill deficit, all participants were asked to respond to a series of five questions. The questions were open-ended rather than in a multiple-choice format in an effort to reduce errors due to random responses. The questionnaire included two problem identification questions and three problem analysis questions. The problem identification questions asked participants to define the presenting problem and to then provide evidence from the vignette to support their problem definition. The problem analysis questions asked participants to report the student's current level of performance, any factors contributing to the skill deficit, and to identify an intervention they thought would be most appropriate. The format of the questions served as a method to ensure participants were reading and interpreting the vignette they read.

If a participant was in the didactic instruction plus modeling condition, then the PIAQ questions were presented after watching a PowerPoint video presentation that included modeling of how to answer questions related to the PIAQ. Participants in this treatment condition were not made aware that they would be asked similar questions after the conclusion of the presentation. Participants in the control or didactic treatment conditions were not presented questions similar to the PIAQ. Information gathered from the PIAQ enabled evaluation of participants' problem identification and analysis skills, either present through the control condition without any instruction or after receiving a form of instruction for problem solving skills.

Pilot Study

A think-aloud pilot study was conducted due to concerns about using the PIAQ as an unverified instrument to measure problem solving skills. Due to the scope of the present study, it was not feasible to run a pilot study with a large sample of participants to get stable reliability estimates. For the pilot study, four elementary education teachers from a public school in the northeastern portion of the state of Oklahoma were recruited. During the think-aloud, Vignette B was read aloud and then the PIAQ was silently reviewed by each participant. Each question on the PIAQ was discussed aloud with the group. Participants discussed their thoughts about each PIAQ question and how they would respond. The interpretation of the PIAQ questions and the answers participants suggested they would give were not concerning and were as expected. Through the use of the think-aloud pilot study it was determined that the PIAQ had face validity.

Scoring Rubric.

Participants' responses on the PIAQ were evaluated by two doctoral students in the School Psychology program at Oklahoma State University using a modified scoring rubric developed by Watson (1991). Watson (1991) originally used two questionnaires that each required their own scoring rubric. Since this study utilized only one questionnaire, only one scoring rubric was necessary (see Appendix D). The rubric helped identify if a participant had the specific problem solving skills that were being assessed. The scoring rubric assessed whether a participant accurately identified and analyzed the presenting academic skill deficit. Each item on the scoring rubric corresponded to a question on the PIAQ.

Participants' responses on the PIAQ were scored using a five-point scale. One point was awarded if a question was left blank, two points were awarded if the response met the requirements for "not at all" (i.e., did not answer the question correctly), three points for "somewhat" (i.e., provided a correct and incorrect response or was almost correct but not quite on target), four points for “well” (i.e., answered the question correctly but did not go in-depth), and five points for “very well” (i.e., answered the question correctly and provided an in-depth response with more than one detail). The maximum total number of points that could be awarded was thirty. The minimum overall score on the PIAQ that participants could receive in order to be considered adequate problem solvers was 24 points. Such a score would reflect a participant receiving a score of 4 points (i.e., a response was correct but did not provide much detail) for each of the 6 items on the scoring rubric.

Before the study began, two doctoral student raters were trained on the use of the scoring rubric. They were considered qualified raters when there was at least 90% agreement achieved between scores for individual questions on the scoring rubric. After the completion of the training phase, the raters had reached an agreement rate of 91%. The raters were naïve to the hypotheses being tested in order to reduce any potential scoring biases. When the study was complete, inter-rater reliability was computed. To achieve this, a small sample of scored questionnaires were compared to find inter-rater reliability. The two individuals independently rated 15 questions and then inter-rater reliability was calculated for every 16th rating. The inter-rater reliability for scored items was 93%. An inter-rater reliability percentage of at least 90% was acceptable for this study.

PowerPoint Video Presentations.

All of the instructional conditions were required to view a PowerPoint video presentation to assist in the delivery of an instructional training. The didactic instruction condition and the didactic instruction plus modeling condition used a PowerPoint video presentation covering problem identification and analysis. For the control condition, participants viewed a PowerPoint video presentation that included information about how to properly prepare for retirement. Each PowerPoint video was embedded in the online survey through Qualtrics to prevent participants from needing to open another application or website. To help ensure participants in each condition spent the same amount of time in a training condition, the length of the PowerPoint presentations were controlled. The PowerPoint video presentations for the control and the didactic instruction conditions were four and a half minutes in length, while the video for the didactic instruction plus modeling condition was nine and a half minutes in length. To ensure participants spent the same amount of time across conditions in Phase 2, brief questionnaires were added to the control and didactic instruction conditions. Participants in the control condition were asked questions directly related to retirement. Those that were in the didactic instruction condition were asked questions related to career satisfaction, satisfaction with the current state of education, and knowledge of policies and procedures in the field of education. These questions were chosen in an effort to reduce any potential carryover effects of answering questions related to problem solving skills and to help control for time.

Vignettes.

The study required the use of two vignettes, one labeled Vignette A and a second labeled Vignette B (see Appendices E and F). The vignettes described an elementary-aged student struggling with an oral reading fluency skill deficit. The vignettes were not identical, but did include children struggling with the same skill deficit. The stories were approximately half a page in length, double-spaced. The information included in the vignettes was sufficient for participants to be able to answer the questions on the PIAQ. For example, the vignettes provided participants with information that ruled out other reading concerns such as decoding issues and provided the student's current level of performance in comparison to peers. Vignette A was only presented to participants in the didactic instruction plus modeling condition during Phase 2 of the study to reduce any practice effects. After viewing Vignette A through the PowerPoint video presentation, participants were guided through answering the PIAQ according to the vignette. Participants were not aware that these questions were part of a questionnaire or that they would see these questions after the completion of the video presentation. Vignette B was seen by all participants during Phase 3 after the completion of their instructional treatment condition.

Debriefing Statement.

A standardized debriefing statement was utilized to inform participants of the study's purpose after they completed the study (see Appendix G). This was deemed necessary due to the ambiguity of the study's purpose when participants were recruited and when giving consent for participation. The debriefing statement also provided an avenue through which to thank participants for their time. Information included the reasoning behind the initial ambiguity, the purpose of the study, and the potential implications of the research. Participants who while completing the Demographic Survey indicated they did not qualify for the study were not provided the standardized debriefing statement. Instead, those participants were thanked for their time and were provided the criteria for participation so they could know why they were disqualified from the study.

Procedures

The study was carried out in three consecutive phases within the same online study using Qualtrics. Participants were provided a link to the study through email during recruitment and through an online research system the participants from a university had access to.

Phase 1.

The first phase of the study involved having participants read consent information (see Appendix H), which also included a brief description about the study, and then having participants provide consent by clicking "Yes". After providing consent, participants indicated their current career status. They were then taken to the appropriate Demographic Survey and were asked to complete the questions included. Any participants who indicated they did not meet the participation criteria for the study were not allowed to proceed past Phase 1. Phase 1 of the study lasted about 10 minutes.

Phase 2.

The second phase of the study required participants be randomly assigned to one of the three instructional conditions. In the control condition, participants viewed a PowerPoint video presentation about preparing for retirement and completed a related questionnaire to control for time. Participants in the didactic instruction condition viewed a PowerPoint video presentation regarding problem identification and analysis of academic skill deficits. These participants also completed a brief questionnaire that was unrelated to problem solving skills to control for time. Participants in the didactic instruction plus modeling condition viewed the same video as participants in the didactic instruction condition, but with the addition of a modeled example that consisted of guided practice using Vignette A to answer the questions on the PIAQ. Participants were not made aware that the questions would be seen later or that they were part of a formal questionnaire. Phase 2 lasted about 10 minutes regardless of the instructional condition.

Phase 3.

Vignette B was provided to all participants during the start of Phase 3. The questions on the PIAQ were presented after Vignette B was viewed. Participants were able to view the vignette while answering each PIAQ question. Participants were required to provide an answer to each question in order to progress to the next question and to complete the study. After the completion of the items on the PIAQ, a standardized debriefing statement was presented to all participants. The debriefing statement thanked everyone for his or her participation and provided information about the purpose of the study. Phase 3 lasted about 10 minutes for all participants.

Analysis

To test for differences among subjects in the instructional treatment conditions, the Demographics Survey was analyzed using an Analysis of Variance (ANOVA). A univariate ANOVA was also computed for the PIAQ. Thus, only one ANOVA was used to analyze the dependent variable. Tukey post hoc analyses, using the Tukey-Kramer modification of significant ANOVA's, was performed to define differences between the experimental groups and the control group and between the experimental groups themselves.

CHAPTER IV

RESULTS

Of the 32 total participants in the study, 17 were in-service teachers and 15 were pre-service teachers. The distribution of participants across instructional conditions was nearly equal within the career status groups. Table 7 summarizes the spread of participants across the instructional conditions by career status. All analyses were considered statistically significant at the .05 significance level.

Demographic Differences

An ANOVA was utilized to test for differences among subjects in the instructional treatment conditions. Table 2 summarizes the data for each characteristic included in the Demographics Survey for in-service teachers and Table 3 summarizes the data for pre-service teachers. One significant difference was found among participants in the three instructional conditions. Among pre-service teachers, there was a significant difference, $F\ (2, 12) = 9.36$, $p = .004$, between the grade each participant intended to teach after graduation. Participants in the control condition indicated they wanted to teach a higher grade ($M = 4.80$, $SD = 1.30$) than participants in the didactic ($M = 2.40$, $SD = .55$) and didactic instruction plus modeling ($M = 3.00$, $SD = .71$) conditions. No other significant differences were found among the demographic variables across the three instructional groups, including the characteristics in-service and pre-service teachers shared (i.e., age, gender).

Research Questions

Research Question 1. Do pre-service and in-service teachers differ with problem solving skills with regards to academic skill deficits?

Results indicated a significant main effect of career status on participants' scores on the PIAQ, F (1, 26) = 5.10, p = .03. Overall, in-service teachers scored higher on the PIAQ (M = 22.53, SD = 3.08) than did pre-service teachers (M = 20.47, SD = 3.07). In addition, in-service teachers in the control condition received higher scores on the PIAQ (M = 20.20, SD = 3.35) than did pre-service teachers in the control condition (M = 17.80, SD = 2.17). This indicates that even without receiving relevant instruction, in-service teachers demonstrated higher quality problem solving skills on the PIAQ than did pre-service teachers. Table 4 summarizes the ANOVA findings, while Table 5 summarizes the means and standard deviations between the career status groups.

Research Question 2. What instructional method will result in the greatest measured problem solving skills among participants?

Results indicated a significant main effect of instructional method on participants' scores on the PIAQ, F (2, 26) = 11.35, p < .001. Tukey post hoc analyses, using the Tukey-Kramer modification of significant ANOVA's, was performed to define differences between the experimental groups and the control group and between the experimental groups themselves. Participants in the control condition scored significantly lower on the PIAQ (M = 19.00, SD = 2.94) than participants in the didactic instruction plus modeling group (M = 24.09, SD = 1.92). In addition, participants in the didactic instruction condition scored significantly lower on the PIAQ (M = 21.36, SD = 2.58) than did participants in the didactic instruction plus modeling condition (*M* = 24.09, *SD* = 1.92). There was not a significant difference among the scores of participants in the control and didactic instruction conditions. Table 4 summarizes the ANOVA findings while Table 6 summarizes the Tukey posthoc results for the instructional conditions.

Research Question 3. Is there an interaction between instructional method and career status?

A univariate ANOVA and visual analysis of graphs plotting the estimated marginal means of participants' scores on the PIAQ did not reveal a significant interaction effect, $F(2, 26) = .07$, $p = .93$. While significant main effects were found for the independent variables career status and instructional method, their interaction did not have a significant effect on the dependent variable.

CHAPTER V

DISCUSSION

The purpose of the present study was to evaluate the problem solving skills of pre-service and in-service teachers and to determine if those skills could be affected by providing some form of problem solving skills instruction. The study sought to determine if pre-service and in-service teachers differed with regards to problem solving skills, to identify what instructional methods produced the greatest measured problem solving skills among participants, and to evaluate if there was an interaction between the instruction received and the career status of participants.

Research Questions

Research Question 1. Do pre-service and in-service teachers differ with problem solving skills with regards to academic skill deficits?

It was hypothesized that pre-service and in-service teachers would differ with respect to their measured problem solving skills. More specifically, it was predicted that in-service teachers would score higher on the PIAQ than pre-service teachers. Overall, in-service teachers received higher scores on the PIAQ than did pre-service teachers. In addition, an examination of the means for the control condition revealed higher scores among in-service teachers than pre-service teachers (see Table 7). This indicates in-service teachers had greater problem solving skills than pre-service teachers even when no problem solving instruction was provided. Interestingly, there were no discernible patterns between PIAQ scores and the number of courses taken related to a pre-service teacher's degree, years of experience as a teacher, whether a graduate degree was held by in-service teachers, nor the age or gender of participants.

It is interesting to note that neither pre-service nor in-service teachers demonstrated acceptable problem solving skills in the current study. The lowest score a participant could receive on the PIAQ to be considered an adequate problem solver was 24. Overall, in-service teachers and pre-service teachers fell short. This may suggest that even in-service teachers somehow lack basic problem solving skills with academic skill deficits. However, in-service teachers who held a certification in reading overall demonstrated acceptable levels of problem solving skills. This could be a result of the presenting concern in Vignette B being a reading deficit. The answers of some pre-service and in-service teachers on the PIAQ indicated they were utilizing subjective reasoning (e.g., identifying the source of the student in Vignette B's struggles as purely confidence issues) instead of relying upon the objective and measurable information that was provided in the vignette. The implications of this for teacher preparation programs could be significant and may indicate the need to teach how to identify problems. If teachers cannot accurately identify a skill deficit, then the rest of the problem solving process will be inaccurate and the problem will not be remediated.

The field of education is significantly lacking research that indicates whether pre-service teachers have acquired any problem solving skills by the time of graduation (Watson, 1991; Watson & Kramer, 1995). The data of the present study may support the notion of a deficiency in teacher training programs with regards to problem solving skills. The data also indicates that time spent as a teacher in the field provides some learning opportunities, but that they may not be sufficient for developing adequate problem solving skills. Ideally, pre-service teachers would enter the field with the ability to be an effective problem solver and would not have to rely upon trial and error to develop those tools.

Research has indicated that about thirty percent or less of the skills pre-service teachers learn while in college will actually be used once they are working (Englemann, 1988). If problem solving skills are not a major component of teacher preparation programs then it seems unlikely any amount of such skills taught would even generalize to a career after graduation. With the knowledge that teachers play an integral role in the referral and intervention process for academically struggling students, it seems crucial to the success of students that teachers receive instruction in the area of problem identification and analysis. The field of education may reach a crisis point if the NCTAF (2010) is correct in hypothesizing that three to five million new teachers will need to be hired by the year 2020. The implications of such a large number of new teachers entering the workforce and who may be unprepared to handle anything but the average student are troubling.

The results of the present study indicating in-service teachers may possess higher quality problem solving skills than pre-service teachers, but that they may not be adequate, has significant implications. Teachers play an integral role in the problem solving process, so it becomes imperative that they understand how to identify and analyze the struggles of their students. Watson & Kramer (1995) postulated that teachers who have effective problem solving skills are more likely to be effective teachers than those who do not have effective problem solving skills. This should be reason enough to ensure teacher preparation programs are giving teachers the tools they need to be effective problem solvers in the classroom. Research has also indicated that training programs for pre-service teachers includes many more courses on behavior management techniques than actual problem solving skills (Watson & Kramer, 1995). While such training is useful, teachers cannot be expected to be successful if training programs do not address how to identify and analyze the struggles of their own students. It is imperative that we continue to identify the deficits in teacher preparation programs to remediate the present concerns.

Research Question 2. What instructional method will result in the greatest measured problem solving skills among participants?

It was hypothesized that there would be significant differences between the instructional conditions. More specifically, it was hypothesized that participants in the control condition would perform significantly lower on the PIAQ than participants in the other two instructional conditions. It was also hypothesized that participants in the didactic instruction plus modeling condition would receive the highest scores on the PIAQ than the other two groups. Significant differences were found between the instructional conditions, but the results did not appear as expected. Participants in the control and didactic instruction conditions scored significantly lower than participants in the didactic instruction plus modeling condition.

No significant difference was found between the control and didactic instruction conditions. This is troubling because it seems logical to assume that some form of problem solving instruction would be better than no instruction at all. This may also indicate that didactic instruction, which is found so often in college classrooms, has little to no place in teacher preparation programs that are training teachers to become successful problem solvers. Data from the present study that supports this notion is that participants in the didactic instruction plus modeling group were the only participants overall to demonstrate acceptable levels of problem solving skills (i.e., a composite PIAQ score above 24).

The results of existing studies regarding the effectiveness of didactic instruction demonstrate little agreement. Some have indicated that didactic instruction is overall ineffective (Ziarnik & Bernstein, 1982) and that it is inferior to more active instructional methods, such as those with a modeling component (Cleven & Gutkin, 1988; Graham & Wong, 1993; Sterling-

Turner, Watson, Wildmon, Watkins, & Little, 2001; Neef et al., 2004). Other studies have demonstrated that didactic instruction is at least as effective as other methods, but not that it is any more effective (Bligh, 2000). The addition of a modeling component in the current study produced the overall highest scores on the PIAQ and only added 5 minutes to the instruction time. It may be safe to infer that the benefits of using a modeling component are much clearer than using didactic instruction alone.

The results of the current study clearly indicate an improvement in problem skills among participants who received instruction with a modeling component as opposed to didactic instruction or no instruction at all. Participants that received instruction with modeling were the only individuals to demonstrate acceptable levels of problem solving skills. While these findings are supported by existing research (Watson, 1991; Watson & Kramer, 1995), which found that didactic instruction was inferior to didactic instruction plus modeling when teaching pre-service teachers problem solving skills, it is interesting that participants in the didactic instruction condition did not perform significantly better than those in the control condition. This may support existing studies that have questioned the usefulness of didactic instruction (Ziarnik & Bernstein, 1982; Bligh, 2000).

Research Question 3. Is there an interaction between instructional method and career status?

It was hypothesized there would be an interaction between the instruction received and the career status of participants. The results did not indicate a significant interaction between a participant's career status and instructional condition. Currently, there is no existing research that can lend to such a discussion. The present study is the first known to include in-service teachers with pre-service teachers when measuring problem solving skills. It is possible that a study with a larger sample population would find a significant interaction effect between a person's career status and the form of problem solving instruction s/he received.

Strengths of this study

There is much to be learned by examining the skills of teachers already in the field and how our universities are preparing pre-service teachers to enter the field. A strength of the present study is that it is the first to examine pre-service and in-service teachers together with regards to problem solving skills. Prior studies have focused solely on pre-service teachers, the results of which do not provide a very clear picture of the issue at hand. The inclusion of both populations in the present study enhanced the generalizability of the results.

An additional strength of the current study is that participants were randomly assigned to one of the three treatment groups. This allowed for better interpretation of participants' scores on the PIAQ and reduced error. In addition, the graduate students who scored participants' responses on the PIAQ remained naive to the hypotheses being tested, which reduced biases in their scoring. An online research system was also used, which reduced concerns about human error in the delivery of the study. The online system ensured participants were distributed across the instructional conditions equally, that all phases of the study were taken to completion, and that participants who did not meet the participation criteria were not allowed to complete it.

Pre-service participants were only chosen from a university where there was direct knowledge of the existing teacher training program. This reduced any concerns regarding whether unexpected levels of performance on the PIAQ could be due to differences in teacher preparation programs across multiple universities. In addition, all participants completed the study anonymously, which reduced concerns about participants' performance being influenced by whether their employer or faculty member would have knowledge of their performance on the PIAQ.

Limitations of this study

The generalizability of the results may be limited by the relatively small sample size. Only 2% of those recruited participated in the study. The ideal sample size would have consisted of at least 60 individuals, but this proved very challenging to obtain. Regardless, it is hypothesized that the current results would generalize to a larger sample size. Successfully recruiting more participants may be possible if additional university training programs and public schools are included in future studies. However, it should be taken into consideration that doing so may add additional sources of error.

Another limitation of the study may be the use of the PIAQ. Due to the scope of the current research, a pilot study with a large number of participants could not be conducted to determine the reliability and internal consistency of the instrument. While the PIAQ was directly based on two existing instruments (Watson, 1991), it was developed solely for the present study and had not previously been tested. A think-aloud pilot study with in-service teachers was conducted in an effort to remediate these concerns.

A potential limitation was that the amount of time participants spent in each phase of the study could not be regulated because it took place online. While the amount of time it took participants to complete the study was roughly equal, it is possible that some participants rushed through a phase or that some spent longer in a particular phase of the study than others. The online survey system did not allow for monitoring of time spent in each phase nor did it allow the researchers to force participants to move through phases of the study.

The nature of how problem solving skills were measured could be a limitation of the present study. Participants' responses on a questionnaire may not accurately reflect their ability to independently use problem solving skills in the field. Essentially, the ability to describe something on paper does not automatically equate to being able to correctly apply the knowledge in a real world situation. The generalizability of the problem solving skills participants demonstrated through the PIAQ cannot be assumed to translate into successful direct application of the skills in such a way that will affect student success.

Directions for future research

Given the disagreement among existing research regarding whether didactic instruction is as effective as instruction with modeling, the findings of the current study support the notion that future research should focus on how to most effectively teach problem solving skills. The current study found little overall differences between the control and didactic instruction conditions. However, participants did demonstrate higher quality problem solving skills when modeling was included with the instruction. This also reflects the findings of previous research (Watson, 1991; Watson & Kramer, 1995). If teachers are expected to independently apply problem solving skills, and research indicates they are already deficient in those skills when they enter the field, then it becomes imperative that we identify the best instructional method for remediating those deficits if we wish to see increased student success.

Numerous studies have indicated the importance of evaluating whether the addition of a performance feedback or reinforcement component is vital to increasing individuals' problem solving abilities (Elliot & Vasta, 1970; Edelstein & Eisler, 1976; Watson & Kramer, 1995). Watson (1991) found that the addition of a feedback component to didactic instruction increased problem solving skills among pre-service teachers, although not significantly. It is possible, however, that adding performance feedback and reinforcement may prove significantly effective at increasing problem solving skills when combined with another method of instruction. The current study may have found a more notable difference between the control and didactic instruction conditions if reinforcement and performance feedback had been added to the didactic instruction. If research were to determine that adding these components greatly improve the acquisition of problem solving skills, then remediating deficits would become relatively easier.

Another worthy direction for future research is measuring problem solving skills among pre-service and in-service teachers with something more precise than a vignette and questionnaire. While participants demonstrated problem solving abilities through their answers on the PIAQ, they may not be able to demonstrate those skills independently in the field. To add to the validity of findings, future research should measure problem solving skills more directly. To do so, researchers could have participants work with a real student and demonstrate how they would identify and analyze the child's presenting problem. This could involve researchers directly observing and scoring how an individual demonstrates proper identification and analysis of a skill deficit. Additional studies could also examine pre-service and in-service teachers' abilities to problem solve behavior concerns. Future research could utilize the scoring rubric included in the present study, but would first need to better determine the reliability and internal consistency of the PIAQ. The findings of such studies could potentially be very meaningful since it would be a more direct measure of an individual's abilities and would aid in the generalizability of any results.

Conclusions

The present study evaluated the problem solving skills among pre-service and in-service teachers, which is an area of research in critical need of attention. While research has examined the existing problem solving skills of pre-service teachers and how to best teach them those skills, previous research has failed to include in-service teachers (Watson & Kramer, 1995; Watson, 1991; Allen & Blackstrom, 2003). In order to improve teacher preparation programs we must first know where pre-service teachers' deficits in problem solving skills lie and how those deficits can best be remediated through instruction. We must also have an understanding of the skills of current teachers and how they are gaining them in the field. Ideally, training programs would ensure new teachers enter the workforce with the skills necessary to be a successful problem solver.

Existing research clearly emphasizes the need for additional studies not only regarding teacher training programs, but also regarding effective methods for teaching problem solving skills to others. Additional studies in these areas could lead to improved teacher training programs, more generalizability of skills to the field after graduation (Scheeler, 2008), and improved outcomes for teachers' students. A shocking number of students are already below proficiency in reading and mathematics (NCES, 2011), a situation that could be improved if pre-service and in-service teachers were trained to correctly identify and analyze students' skill deficits. Targeted instruction to remediate skill deficits cannot occur successfully unless the problem has already been appropriately identified and analyzed.

Little research exists regarding what specific skills a teacher's repertoire should include to help maximize student success **(**Cleven & Gutkin, 1988). The current data from the National Assessment for Educational Progress, however, suggests this is a critical area deserving of research due to the low percentage of students that are proficient in basic academics (NCES, 2011). While we are training teachers in instructional strategies and principles of learning, we are not successfully training teachers to implement interventions or assessment strategies (Begeny & Martens, 2006).

Given the importance of student success, it is imperative that research continues to further address the ability of teachers to utilize problem solving methodologies to improve academic outcomes for students. The results of the current study indicate there are gaps in the problem solving skills of pre-service and in-service teachers, and that didactic instruction is not as effective as instruction with a modeling component for increasing those skills. It is imperative that research in this area continues because the better a teacher's problem solving skills, the more effective he or she is likely to be as a teacher (Begeny & Martens, 2006), and the more likely we are to create the change we want to see in student outcomes.

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APPENDICES

Table 1

Demographic Characteristics of Sample (N=32

Characteristic	Pre-Service Teachers *n* (%)	In-Service Teachers *n* (%)
Age		
18-24	12 (80%)	--
25-34	3 (20%)	4 (23.5%)
35-44	--	4 (23.5%)
45-54	--	5 (29.5%)
55-64	--	4 (23.5%)
Gender		
Male	--	2 (11.8%)
Female	15 (100%)	15 (88.2%)
Primary Language		
English	15 (100%)	17 (100%)
Highest Degree Earned		
Bachelor’s	--	8 (47.1%)
Master’s	--	9 (52.9%)
Career Status		
Undergraduate Student	15 (100%)	--
Graduate Student	--	2 (11.8%)
Teacher in Iowa	--	15 (88.2%)
Primary Grade (taught or intended)		
Kindergarten	--	5 (29.4%)
First Grade	4 (26.7%)	2 (11.8%)
Second Grade	6 (40.0%)	2 (11.8%)
Third Grade	2 (13.3%)	1 (5.8%)
Fourth Grade	1 (6.7%)	2 (11.8%)
Fifth Grade	2 (13.3%)	5 (29.4%)
Years of teaching experience		
1-10	--	6 (35.4%)
11-20	--	3 (17.6%)
21-30	--	5 (29.4%)
31-40	--	3 (17.6%)
Certification (non-EE)		
Early Childhood	--	3 (17.6%)
Health	--	1 (5.9%)
Master Educator	--	4 (23.5%)
Reading Endorsement	--	5 (29.4%)
Number of Related Courses		
1-10	4 (26.7%)	--
11-20	10 (66.7%)	--
21-30	1 (6.6%)	--

Table 2

ANOVA Summary of In-Service Teacher Demographic Variables

Characteristic	Control *M* (*SD*)	Didactic *M* (*SD*)	Modeling *M* (*SD*)	*F*	*p*
Age	44.00 (14.78)	41.00 (14.18)	48.17 (8.09)	.49	.62
Gender	1.20 (.45)	1.17 (.41)	1.00 (.00)	.56	.58
Highest Degree Earned	1.60 (.55)	1.33 (.52)	1.67 (.52)	.67	.53
Primary Grade Taught	3.60 (2.30)	4.17 (1.94)	2.67 (2.25)	.74	.50
Years of Experience	14.20 (10.57)	15.25 (12.26)	24.67 (8.71)	1.70	.22
Current AEA Teacher	1.20 (.45)	1.17 (.41)	1.00 (.00)	.56	.58
Current Graduate Student	1.80 (.45)	1.83 (.41)	2.00 (.00)	.56	.58
Certified Early Childhood	2.00 (.00)	1.67 (.52)	1.83 (.41)	.98	.40
Certified in Health	1.80 (.45)	2.00 (.00)	2.00 (.00)	1.24	.32
Certified as M. Educator	1.60 (.55)	1.83 (.41)	1.83 (.41)	.47	.64
Certified in Reading	2.00 (.00)	1.67 (.52)	1.50 (.55)	1.72	.22

* Significant at the $p < .05$ level

Table 3

ANOVA Summary of Pre-Service Teacher Demographic Variables

Characteristic	Control *M* (*SD*)	Didactic *M* (*SD*)	Modeling *M* (*SD*)	*F*
Age	22.20 (2.49)	20.60 (.55)	23.40 (5.03)	.93
Gender	1.00 (.00)	1.00 (.00)	1.00 (.00)	--
Intended Grade	4.80 (1.30)	2.40 (.55)	3.00 (.71)	9.36***
Related Courses	14.60 (6.88)	12.20 (5.45)	13.80 (1.92)	.28

*** Significant at the $p < .01$ level

Table 4

Summary of Univariate ANOVA Tests of Between-Subjects Effects

Source	*df*	*SS*	*MS*	*F*	$\eta^2_{partial}$
Career Status	1	29.68	29.68	5.10*	.16
Instructional Method	2	132.11	66.05	11.35**	.47
Career x Instruction	2	.86	.43	.07	.01
Error	26	151.27	5.82	--	--
Total	32	15196.00	--	--	--

* Significant at the $p < .05$ level

** Significant at the $p < .001$ level

Table 5

Mean Composite Scores on the PIAQ by Career Status (N=32)

Career Status	*n*	*M*	*SD*	Cohen's *d*
Pre-Service	17	20.47	3.07	-.67
In-Service	15	22.53	3.08	.67

Table 6

Tukey Posthoc Analyses for Instructional Conditions

(I) Condition	(J) Condition	*Mean Difference* (I-J)	*Std. Error*	*p*
Control	Didactic	-2.36	1.05	.08
	Modeling	-5.09	1.05	.00**
Didactic	Control	2.36	1.05	.08
	Modeling	-.2.73	1.03	.04*
Modeling	Control	5.09	1.05	.00**
	Didactic	2.73	1.03	.04*

* Significant at the $p < .05$ level

**Significant at the $p < .001$ level

Table 7

Mean Composite Scores on the PIAQ by Treatment Condition and Instructional Condition (N=32)

Career Status	Control *M* (*SD*)	Didactic *M* (*SD*)	Didactic + Modeling *M* (*SD*)
Pre-Service	17.80 (2.17)	20.40 (2.51)	23.20 (3.07)
	n=5	*n* =5	*n* =5
In-Service	20.20 (3.35)	22.17 (2.56)	24.83 (1.72)
	n =5	*n* =6	*n* =6
Cohen's *d*	.85	.70	.66

Appendix A

Demographics Survey

In-Service Teachers

1. Age: ___________ 2. Gender: ☐ Male ☐ Female

3. Years of experience as a teacher: ____________

4. Grade taught: ☐ Kindergarten ☐ First ☐ Second ☐ Third ☐ Fourth ☐ Fifth

5. What is your primary language? _________________________

6. Highest degree earned : ☐ Bachelor's ☐ Master's ☐ PhD/EdS

7. Are you certified? ☐ No ☐ Yes

   If yes, what type of certification do you hold? ______________________

8. Are you currently enrolled in a graduate degree program within Teaching, Learning, and Leadership?

☐ No ☐ Yes

9. Are you currently a teacher working in a school served by Heartland Area Education Agency 11?

☐ No ☐ Yes

10. Are you a General Education teacher?

☐ No ☐ Yes

11. Do you have a bachelor's degree in elementary education?

☐ No ☐ Yes

Appendix B

Demographics Questionnaire

Pre-Service Teachers

Please answer the following questions to the best of your ability.

1. Age: ___________

2. Gender: ☐ Male

☐ Female

3. What is your current classification? ☐ Freshman
   ☐ Sophomore
   ☐ Junior
   ☐ Senior
   ☐ Other (Explain: ___________________________)

4. What grade do you intend to teach? _________________________

5. What is your primary language? _________________________

6. Do you currently have an undergraduate degree? ☐ Yes

   ☐ No

   If yes, what was your degree in? ____

7. Are you currently pursuing a degree in elementary education? ☐ Yes

   ☐ No

8. How many courses have you taken that are related your degree? ___________

9. Have you completed or are currently completing student teaching? ☐ Yes

   ☐ No

Appendix C

Problem Identification and Analysis Questionnaire

(PIAQ)

1. Define the problem

___

___

___

2. Provide direct evidence from the vignette to support your definition of the problem

___

___

___

___

___

3. What is the student's current level of performance?

___

___

___

4. What factors are contributing to the student's academic struggles?

5. What kind of intervention is most likely appropriate for such a problem analysis?

Appendix D

Scoring Rubric for the PIAQ

PIAQ Question 1:

1. To what extent was the academic skill deficit correctly identified?

1	2	3	4	5
No answer	Not at All	Somewhat	Well	Very Well

2. To what extent was the skill deficit defined in objective and measurable terms?

1	2	3	4	5
No answer	Not at All	Somewhat	Well	Very Well

PIAQ Question 2:

3. To what extent was direct evidence used in the answers for questions one and two?

1	2	3	4	5
No answer	Not at All	Somewhat	Well	Very Well

PIAQ Question 3:

4. To what extent was the student's current level of performance accurately described?

1	2	3	4	5
No answer	Not at All	Somewhat	Well	Very Well

PIAQ Question 4:

5. To what extent were contributing factors accurately identified?

1	2	3	4	5
No answer	Not at All	Somewhat	Well	Very Well

PIAQ Question 5:

6. To what extent was an appropriate intervention identified?

1	2	3	4	5
No answer	Not at All	Somewhat	Well	Very Well

Appendix E

Vignette A

Michelle is a seven year-old female in your second grade classroom. You have noticed her struggling with reading both independently and in small group formats. She has shown mastery of basic reading skills, such as letter recognition and blending. However, Michelle struggles to keep up with other students when reading as a group. While reading in groups, she follows what other students are reading with her finger. You notice that she quickly falls behind, stops following along, and then stares off into space. You decide to pull Michelle aside and have her read three passages one-on-one with you while you time her for a minute and mark her reading errors. The reading passages you select are on the second grade level. You calculate the numbers of word read incorrectly and correctly. In order to have something to compare her scores to, you administer the same task to the rest of the students in your classroom. You find that while Michelle is overall accurate when reading, the numbers of words read correctly in one minute puts her in the bottom tenth percentile compared to her peers. While reading, Michelle does not sound out words but does pause before saying words sometimes and also says them very slowly.

Appendix F

Vignette B

Luke is an eight year-old male in your third grade classroom. He appears to struggle when reading, even when you are there to help him. He has mastered basic reading skills, such as identifying letter sounds and decoding. You notice that whenever Luke is asked to read something aloud for the class or to read independently, he becomes fidgety and distracts others. You pull Luke aside and have him read three passages written on his grade level, for one minute each. You calculate the number of words read incorrectly and correctly. While you're happy to see that Luke is an overall accurate reader, you notice that the number of words he reads correctly in a minute is obviously below his grade level. In order to have something to compare his scores to, you administer the same passages to the rest of the students in your classroom. Compared to the rest of the class, Luke's number of words read correctly in a minute falls in the bottom ten percent of the class. While reading, Luke does not sound out words but does pause before saying words sometimes and also says them very slowly.

Appendix G

Debriefing

The research team would like to thank you for participating in this study. As you know, the purpose of the present study was not initially fully disclosed to you. We adopted this approach so that your performance would not be influenced by any hypothesis you may have guessed we were aiming for. Our goal was not to trick you, but to allow for you to respond naturally to questions.

I would like to take a few minutes to tell you about what the study was investigating. We were examining the problem solving skills, specifically problem identification and analysis, of pre-service and in-service teachers with regards to an academic skill deficit. We were interested in comparing these skills between undergraduate students who are training to become teachers and graduate students or current teachers that have experience as teachers. We were especially interested in discovering if there is a difference between what undergraduate students are taught to do and what teachers are actually doing in the field to identify and analyze academic skill deficits in the classroom. In addition, there was a teaching component which you all participated in. Not only were we comparing your answers on the PIAQ among the groups, but we were also interested to see if particular methods of instruction would result in the greatest problem solving skills among the groups. We believe this study is important because it has the potential to inform institutional curriculum for undergraduate students seeking an elementary education degree and because it could lead to improved problem solving skills among those that have participated in the study.

So, as you may see there are some misleading aspects to this study, but we hope that you understand that they were included for important reasons. Your participation today was greatly appreciated. In closing, we ask that you do not discuss this study with anyone else until the end of the semester because it could affect data collection.

You may contact any of the researchers at the following addresses and phone numbers, should you desire to discuss your participation in the study and/or request information about the results of the study: Sarah Banks, M.S., (214) 546-3405, sarah.banks@okstate.edu, or Gary Duhon, Ph.D., (405) 744-9436, gary.duhon@okstate.edu.

Appendix H

ADULT CONSENT FORM
OKLAHOMA STATE UNIVERSITY

PROJECT TITLE: Assessing skills of Pre-service and In-Service Teachers

INVESTIGATORS: Sarah Banks, M.S., Gary Duhon, Ph.D., Oklahoma State University

PURPOSE:
You are being asked to participate in the present research study because of your relevant experience in elementary education. In short, this study will examine particular skill areas of undergraduate students pursuing a degree in elementary education and graduate students and current teachers who already possess a degree in elementary education. The particular skills this study seeks to examine will be gathered through your responses on two questionnaires.

PROCEDURES
Undergraduate and graduate students will be recruited from Oklahoma State University's Stillwater and Tulsa campuses through online methods, including the SONA system and email. In addition, elementary school teachers will be recruited within the schools served by Heartland Area Education Agency 11 in Iowa. Undergraduate students will meet the following criteria: (a) are undergraduate students who are currently juniors in a bachelor's degree program for elementary education, and (b) who have not yet completed classroom observations or student teaching. Graduate students and current elementary education teachers will meet the following criteria: (a) currently pursuing a Master of Science degree in Teaching, Learning, and Leadership, or a Master of Science degree in Curriculum and Leadership Studies (applies only to graduate students) (b) have an undergraduate degree in elementary education, (c) have at least one year of teaching experience, (e) are not currently Special Education teachers, (f) do not have an alternative certification, and (f) and are not currently other faculty, such as Speech-Language Pathologist, Occupational Therapist, Principal, etc.

If you agree to take part in this study, you will be asked to complete a Demographics Survey, which will collect information such as your age, gender, and highest degree earned. You will also be asked to complete an additional questionnaire during the third phase of the study.

The data will be collected online using Qualtrics. This study is designed to last a maximum of one hour. The time will be divided into three phases, with Phase 1 and Phase 3 lasting fifteen minutes and Phase 2 lasting thirty minutes.

RISKS OF PARTICIPATION:
The investigators believe there are no known risks associated with this research study. However, a possible inconvenience may be the time it takes to complete the study. Participation in this research is voluntary.

BENEFITS OF PARTICIPATION:
You may not directly benefit from this research. However, we hope that your participation in the study enhances the particular skills targeted, and that this enhancement has practical application. In addition, the investigators can send you a copy of the results of the study when it has concluded if you are interested. Please email one of the researchers if you wish to have the results of the study sent to you after its conclusion.

The study will be offered on SONA for undergraduate students who are eligible to participate in the study and who are enrolled in courses offering extra credit opportunities. Those who meet the predetermined criteria will be chosen to participate in the study for an extra credit opportunity. Students who are not eligible to participate may receive extra credit through other opportunities already presented by professors of classes they are enrolled in or through other studies on SONA.

CONFIDENTIALITY:
The records of this study will be kept private. Any written results will discuss group findings and will not include information that will identify you. Research records will include a list of SONA ID numbers of participants and will be stored securely using a password; only researchers and individuals responsible for research oversight will have access to these records. If you are a student participating for extra credit for a class, your professor will be notified of your participation but will not have access to any of the data collected. Your responses on the surveys will be kept confidential and will not be connected to your name.

This consent form, your responses to the surveys, and the list of SONA ID numbers will be maintained in paper form in a secure filing cabinet owned by the principle investigators, as well as in electronic form in a computer file that is password protected and will be only accessible to the principle investigators. After 8 years from the date of data collection, the electronic data will be deleted and any paper copies will be destroyed using a paper shredder.

COMPENSATION:
You will not receive payment for your participation in this research study.

CONTACTS :
You may contact any of the researchers at the following addresses and phone numbers, should you desire to discuss your participation in the study and/or request information about the results of the study: Sarah Banks, M.S., (214) 546-3405, sarah.banks@okstate.edu, or Gary Duhon, Ph.D., (405) 744-9436, gary.duhon@okstate.edu. If you have questions about your rights as a research

volunteer, you may contact Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu.

PARTICIPANT RIGHTS:
I understand that my participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time, without penalty.

CONSENT DOCUMENTATION:
I have been fully informed about the procedures listed here. I am aware of what I will be asked to do and of the benefits of my participation. I also understand the following statements: I affirm that I am 18 years of age or older.I am aware that the data may be available for future publication after the completion of the study. However, my data will be kept confidential at all times during the study

It is recommended that you print a copy of this consent page for your records before you begin the study by clicking below.

If you choose to participate: Please, click YES if you choose to participate. By clicking YES, you are indicating that you freely and voluntarily and agree to participate in this study and you also acknowledge that you are at least 18 years of age.

Appendix I

IRB Approval Letter

Oklahoma State University Institutional Review Board

Date:	Thursday, March 07, 2013
IRB Application No	ED1310
Proposal Title:	Assessing Problem Solving Skills Among Pre-Service and In-Service Teachers with Regards to Academic Skill Deficits
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 3/6/2014

Principal Investigator(s):

Sarah Banks	Gary J Duhon
107 UAT Building	423 Willard
Stillwater, OK 74078	Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

✗ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

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

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval. Protocol modifications requiring approval may include changes to the title, PI, advisor, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Dawnett Watkins 219 Cordell North (phone: 405-744-5700, dawnett.watkins@okstate.edu).

Sincerely,

Shelia M. Kennison

Shelia Kennison, Chair
Institutional Review Board

VITA

SARAH ELIZABETH BANKS

Candidate for the Degree of

Doctor of Philosophy

Thesis: ASSESSING PROBLEM SOLVING SKILLS AMONG PRE-SERVICE AND IN-SERVICE TEACHERS WITH REGARDS TO ACADEMIC SKILL DEFICITS

Major Field: Educational Psychology with option in School Psychology

Biographical:

Education:
Completed the requirements for the Doctor of Philosophy in Educational Psychology with an option in School Psychology at Oklahoma State University, Stillwater, Oklahoma in July, 2014.

Completed the requirements for the Master of Science in Educational Psychology with an option in School Psychometrics at Oklahoma State University, Stillwater, Oklahoma in 2010.

Completed the requirements for the Bachelor of Science in Child Learning and Development and the Bachelor of Arts in Psychology at University of Texas at Dallas, Richardson, Texas in 2009.

Experience:

120hr. Education Field Experiences Practicum at Skyline Elementary, Fall '09
240hr. Shadow Practicum at Richmond Elementary, Fall '10 - Spring '11
600hr. School Based Practicum at Richmond Elementary, Fall '11 - Spring '12
400hr. Clinic Practicum at the School Psychology Clinic, Fall '12 - Spring '13

Professional Memberships:
School Psychology Graduate Organization (SPGO), Student Member
Southwestern Psychological Association (SWPA), Student Member
National Association of School Psychologists (NASP), Graduate Affiliate
American Psychological Association (APA), Division 16, Student Member