

Special Section: Undergraduate Research Scholars in Education

**Applying Theory, Practice, and Research:
The Key to the Development of Future Elementary Education Teachers in the
Professional Development School (PDS) Model**

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Abstract:

Five students from the College of Education prepared articles for the 2012 edition of *The Eagle Feather*. The introduction for this special section examines the students' articles from the perspective of teacher development through theory, practice, and research. The article provides the background, conceptual framework, and ongoing study of pre-service teachers' (interns') growth in knowledge of content pedagogy as a result of the theory-practice-research model in which they are prepared as teachers in the Professional Development School (PDS). Two authors examined mathematics tutoring projects from the perspective of methodology, two authors from a personal development perspective, and a fifth analyzed more 300 action research studies. In all five cases, interns demonstrated deeper knowledge of content pedagogy, showed increased development as teachers, and demonstrated the value of the theory-practice-research PDS model.

Purpose

The purpose of this article is to provide some background understanding that supports the five studies presented by authors in this section. The background is found in the University of North Texas (UNT) College of Education Professional Development School (PDS) program which is used to prepare the undergraduate elementary education/interdisciplinary studies majors/interns as teachers. The program is a one year internship that includes coursework tied to field studies, practical application of theories learned in university courses, and community building between UNT and school districts that result in research. The PDS, in which the five authors were prepared as teachers, bases its operations on the relationship between theory, practice, and research. Research is conducted by three constituent groups that include university coordinators, university interns, and mentor teachers/administrators.

PDS Purpose

The PDS model is a program in which pre-service teachers develop teaching skills and techniques and are guided in the practice of conducting research in the field and relating theory to practice. The PDS is a movement started in 1988, following the dissemination of a report by the National Commission on Excellence in Education (NCEE), *A Nation at Risk: The Imperative for Educational Reform* (1983). The commission described a deteriorating school system ripe for reform and cited teacher preparation programs as contributory to the demise of public education. In 1986, in response to the report, a group of deans of colleges of education began a series of meetings that resulted in the formation of the Holmes Group. The Holmes Group created a trilogy of documents: *Tomorrow's Schools* (1990), *Tomorrow's Teachers* (1986), and *Tomorrow's Schools of Education* (1995), which established the PDS model as a response to the call for shared responsibility between schools and universities in promoting reform in education.

In this new model, colleges of education were encouraged to learn from the medical profession's approach that ties theory to practice through research in the field. The idea is that teachers in preparation would study at the university to garner knowledge of the theories of education. When the students are placed in internships/residencies in schools, the schools would have a solid partnership with the universities. The research in the schools would serve to inform instructional practices in the universities and schools. All parties in the universities and schools would have parity, shared governance, and stakes in the success of pre-service teachers/interns, for the sake of improving and reforming schools.

Some colleges of education embraced the new form of teacher preparation and for more than 20 years, several joined in the process of scholarly inquiry and programs of research. Professional development schools are charged by the Holmes Partnership with four responsibilities: 1) preparing pre-service teachers, 2) providing professional development for in-service teachers, 3) encouraging academic achievement among students in schools, and 4) promoting inquiry. Two main organizations have emerged to support PDS research and practice: The National Association of Professional Development Schools (NAPDS, 2010) and the Professional Development Research Interest Group of the American Educational Research Association (AERA, 2012). Teachers, interns, professors, and school administrators are encouraged to present at the national conferences hosted by these organizations that reward excellence and encourage further study.

PDS at UNT

The hallmark of the PDS success is collaboration. Collaboration requires shared governance, parity, supportive environments for learning, and the development of professional learning communities. The PDS collaborative at UNT, from which the five research projects are

chronicled in this journal, fostered this notion. All constituents, including mentor teachers, school administrators, university personnel, university students, and parents, contributed to the programs that tied together the university and the school. Three research-based projects that grew out of the collaborative are discussed in the papers included in this section of the journal. The projects were inspired by needs discovered by three different constituent groups in the PDS and have been sustained for multiple years because of the spirit of collaboration.

PDS Projects

One project, the mathematics tutoring project, developed from a need brought to the PDS group from the school principals. They noted that, based on state standardized tests, there was a need to target students with specific deficiencies in mathematics. To address this need, the university instructor of mathematics methods changed her course to accommodate preparation of PDS interns to tutor mathematics. The instructor used diagnostic principles, Response to Intervention (RTI) methodology, and reflective teaching. The project was originally designed as an experimental study to determine whether tutoring by PDS interns affected mathematics learning among elementary and middle school students. The results of the three-year experiment showed that the experimental groups, those randomly selected to receive tutoring from PDS interns, scored at a statistically significant higher rate when compared to randomly-selected non-tutored students. These results led the instructor to know that the diagnostic, RTI, and reflective teaching designs were meaningful approaches to assisting the schools toward higher achievement in mathematics.

This project has been sustained for seven years in the PDS, each year showing the same significant differences between pretests and posttests. In the four subsequent years following the experimental year of 2005, a quasi-experimental design was applied, resulting in significant

differences in pretest and posttest scores among students tutored. The main goal in the tutoring project was to support academic achievement among elementary and middle school students, but the development of the pre-service teacher as a responsive, reflective teacher was a natural and positive outgrowth. Several of the authors in this section refer to the tutoring projects [Jamadar, Hughes, Walker, and Carlson] and to the personal gains made by the students as they engaged in the process within the context of an RTI model.

A second project initiated by the PDS was the Fiesta Math Night. This project was brought to consideration for the PDS collaborative by a classroom mentor teacher who noted that the Family Math Night she had promoted in her Title I school garnered only five parents and children from a school of 600. She was in need of some assistance in creating a more engaging experience for primarily Latino parents and children. The mathematics and social studies methods instructors agreed to find a way to engage the PDS interns in reaching out to the Title I schools in the district. To that end, Fiesta Math Night (Noche de Fiesta de Matemáticas) was created. In the university mathematics methods course, the interns learned how to consider mathematics content and to craft carnival games that included content for each grade level, kindergarten through eighth grade. In addition, the interns were immersed in the study of Latino culture, using themes such as the 2010 anniversaries of the Mexican Revolution and Independence as cultural knowledge for creating games. Fiesta Math Night occurs each fall in three different schools and involves the PDS interns leading their culturally relevant mathematics games in a fiesta-like atmosphere in the Title I elementary school. The goal is to engage both parents and children.

Since the inception of Fiesta Math Night, the originating school has engaged over 1100 students and parents. Over 6000 parents and children have been served by this program in 38

schools across five years. Also, research shows the transformation of interns as they began to value the Hispanic culture, the ethnic majority enrolled in Title I schools in Texas. It also shows the value of putting creation, implementation, and learning in the hands of the PDS interns. As the interns engage with children and parents, they grow from input to response and to valuing the Hispanic culture (Montejano & Tunks, 2010). The Walker article in this section of the journal discusses the Fiesta Math Night project, in conjunction with the tutoring project, which occur simultaneously.

A third project initiated by the university PDS coordinator, action research, was born from an examination of the National Council of Accreditation of Teacher Education (NCATE) programs standards for professional development schools (Levine, 2001). These standards were developed after five years of study by the American Association of Colleges of Teacher Education (Neapolitan, 2004). The standards provide PDS workers with a framework for applying the Holmes principles, a rubric for determining levels of development of a PDS, and descriptors that guide change and progress. In 2005 and again in 2008, teachers, principals, interns, and university personnel in the PDS used the standards to determine the current practices as related to the NCATE PDS standards and found that although many areas were covered, action research was not. This omission was addressed by principals and lead teachers, who, in 2008, required that all mentor-teachers conduct action research with PDS interns in the second semester of the internship. Mentor teachers and PDS interns have completed approximately 300 studies since the inception of the action research project. The projects are supported by the university coordinators, but are designed, implemented, and studied by the mentor teachers and interns. The purpose of action research is for teachers to better understand classroom issues that are pertinent to improved classroom practices, student achievement, and/or teachers' instruction.

Potter's article in this section of the journal examined the 300 studies, seeking an understanding of the trends in the studies.

Coursework Leads to Research

The first semester of their senior year, the PDS interns complete a set of pedagogical courses in four subject areas: social studies, mathematics, science, and language arts. Each course presents the theories and practices of teaching content in a particular subject in the elementary school. These courses are blocked across two full days of instruction and provide multiple hands-on experiences. In addition, PDS interns spend two days a week in schools where they apply the theories introduced in these courses. These practical applications revert to class and web-based discussions for further understanding of the connection between theory and practice. While this is valuable, a more effective model of teacher preparation is one that follows the medical, nursing, and psychology fields, which use theory-practice-research methodologies. The courses in the PDS follow this theory-practice-research model; hence, students in the courses are expected to complete research during their field experiences.

The PDS courses are designed to guide students through the research process. As an example, in the tutoring project, students are taught how to investigate differences in student learning. In class, students are taught about diagnostic instrumentation that they then use in the field for diagnosing third, fourth, and fifth grade students' mathematics knowledge and skills. They are also instructed in RTI methodology. RTI is used in schools when students are targeted for Tier I or II interventions. These interventions occur in small or individual sessions, respectively. Tier II interventions are recommended for approximately 15 percent of the students due to their understanding of concepts. Tier I interventions are recommended for approximately 5 percent of the students to establish any understanding of concepts. Tier III students represent

80 percent of the students taught in large classes; generally, this group of students does not need additional intervention by a specialist. PDS interns are tutoring students primarily at the Tier II level.

In the university mathematics methods course, pedagogy focuses on the mastery model for the purposes of tutoring. The mastery model uses a lock-step approach to developing the mastery of a concept through successive levels of demonstration, coupled with three levels of practice. PDS interns use the instruction from the university course to diagnose six children in third through fifth grades. After evaluation, they prescribe interventions based on diagnostic results. The interventions include weekly formative assessments in the form of targeted mathematics games from iPad apps, board games, and other sources that are sometimes invented by the PDS interns or found on the internet. Each week the PDS interns and the mathematics professor communicate about the direction the RTIs are taking and whether the diagnostic results are being targeted. At the end of six weeks of tutoring interventions, the PDS interns administer a posttest that is identical to the original diagnostic. As part of the mathematics methods course, PDS interns are expected to analyze the data comparing pretests and posttests to determine differences in scores. In addition, they examine their processes of completing the tutoring project and the effects of the projects on them as teachers. All of this work is compiled into a research report.

Development of PDS Interns as Teachers through Research

Development toward becoming a teacher is a complex process. Each person entering a teacher preparation program has already experienced teaching from kindergarten through the junior year in college. These fifteen years serve as the foundation of how pre-service teachers/PDS interns envision teaching and learning. If their experiences were positive, pre-

service teachers enter the teacher preparation program eager to translate their experiences into the lives of children. In an alternate case, if prior experiences were less than positive, PDS interns enter the program eager to make a difference, with a desire to give the next generation of children a positive experience. No matter how they enter the PDS program, most interns begin with limited understanding of content-pedagogy—the art and science of teaching content with a specific pedagogy.

Preparation of pre-service elementary teachers requires an understanding of the factors influencing success. One influential factor, anxiety about performing mathematically and teaching mathematics, inhibits pre-service teachers' preparation (Alsalouli, 2004; Bruce, 2004; Utley & Showalter, 2007; Zacharos, Koliopoulos, Dokimaki, & Kassoumi, 2007). Swars (2005) and Bursal and Paznokas (2006) noted that pre-service teachers' anxiety is inversely related to their efficacy in teaching mathematics. Pre-service teachers with lower anxiety demonstrated a higher level of confidence in their ability to teach mathematics while those with high anxiety reflected lower confidence. According to Rule (2006), pre-service teachers produced symbolic drawings during a pretest in which 63 percent expressed negativity toward their mathematics experiences and 60 percent expressed negative emotions toward mathematics learning. These findings suggest that preparation of pre-service elementary teachers raises concerns about successful preparation, particularly when they begin mathematics pedagogy courses fearful of mathematics learning and teaching. Tunks and Bain (2009) found that when using art as metaphor, students in pre-course responses showed fear of mathematics learning and teaching among 80 percent of the students who responded, while the other 20 percent show moderate to extreme confidence. The knowledge of this disparity and the needs of university students to feel

confident when teaching mathematics prompted changes in university instruction toward raising confidence.

Projects in the methods courses are designed to develop each intern to their fullest capacity. However, if fear grips a PDS intern, adjustments have to be made to accommodate the documented fears. Though the tutoring project was designed initially to serve the children in the district, the effect on PDS interns changed from fear to favor as noted by the interns' narrative responses through the semester and in their portfolios. Tunks and O'Brien (2010) examined the effect of multiple field-based projects on interns' perception of themselves as evolved teachers of mathematics and found that students whose levels of fear were quite high showed marked changes in perception and readiness to teach mathematics to children. Each person entering the school arrives with a different set of lived experiences, sensibilities, and expectations. Therefore, each person's gains, expressions, and perceptions about the theory-practice-research approach to teacher formation will vary, as noted in the four papers published in this section of the journal.

Mathematics Tutoring Project

The four papers that follow in this section of the journal show a spectrum of response to tutoring children in mathematics. These responses are based on personal perspective, yet chronicle the same set of events: diagnostic, intervention, reflection, post-testing, analysis, and conclusion. What differs across the four papers is apparent through an examination of the personal connections to the project. Each intern shaped the project uniquely, and they, in turn, were shaped by the project. The authors crafted their research articles to reflect their perceptions of the tutoring project. They especially focused on what inspired them to study the work further. Each wanted to determine meaning and value in the project and the findings that resulted. All papers show teachers in the evolutionary process of defining the parameters of teaching

excellence through the examination of their experienced mathematics learning and teaching experiences.

Two authors in this section of the journal, Hughes and Carlson, approached research on the tutoring project from the perspective of methodology. In both papers, the authors examined data from eight weeks of narratives to extract the methodological elements. Hughes showed a studied approach of the weekly analyses of student learning, instructor learning, and success of the plans. In her analysis, she notes that by focusing on the child, staying the course with weekly formative examination of progress from concept to concept, a teacher can learn how to guide students toward academic achievement. Her tutoring followed the learners through the fundamental mathematics concept of place value. This is particularly striking, since all of her students showed needs in other areas as well, yet this fundamental concept served as the focus for the majority of the sessions. Often PDS interns feel the need to address every need noted in the diagnostic but instead, Hughes stayed focused on this basic concept. When the students achieved an understanding of the fundamentals of place value, they were able to move forward to higher-level concepts. Hughes articulated the importance of providing hands-on experiences in real world contexts. Her article implies that this was a new approach to her as she went outside the boundaries of her previous experiences. She was able to apply her learning from the course which resulted in a difference for the students she tutored. Her paper also suggests a PDS intern whose confidence in doing mathematics was positive.

Carlson, who also viewed the tutoring project from a methodological perspective, instead chose to examine the project within the context of pedagogy. The first methodology she discusses, the mastery model, is presented in the context of specificity. In essence, she notes that when students need Tier II interventions (small group sessions), they learn well through the use

of lock-step pedagogical practices. In her notes she chronicles how demonstration and multiple levels of practice benefited students in the tutoring process. The implication in her paper is that she is slightly confident in her mathematics knowledge and skills; hence, she further developed confidence throughout the tutoring project. The second method that resonated with her, the RTI model, also represents specificity. The RTI model requires reflection on practice, student response to interventions in the form of tutoring lessons, and decisions for changing practice to bring about learning. Her notes from the weekly responses included in her paper show the depth of that specificity applied to her project.

In contrast, the other two authors who wrote about the tutoring project, Jamadar and Walker, approached research from personal perspectives. Each author presented autoethnographic studies which demonstrated progress toward becoming teachers of mathematics. In an autoethnographic study, self-reflection and autobiographical stories of the researcher's personal experiences extend to cultural, political, and social meanings and understandings (Ellis, 2004; Marechal, 2010). Both authors used this method to examine their participation in the tutoring project, and in Walker's article, the tutoring and Fiesta Math Night projects. In both cases the authors examined the social meanings of being a teacher from their deeper understanding of their progress across the tutoring experiences and Fiesta Math Night.

Where the two authors differed was in the approach to the autoethnography. Jamadar examined her university experience within the contexts of the mathematics department, the college of education, and early teaching coursework. Her description of her utopic perspective of the teaching profession and her journey through university courses provides a picture of a teacher developing herself through a comparative method. She presents her perception of teachers as invincible, omnipotent, and beyond reproach. She sought to find insight into what it took to reach

this ideal. Her details of the multitude of experiences that did not provide this insight verify the ideal, rather than the real. However, when she engaged in the process of tutoring young children, which was far from her ideal, she reconciled herself to the realities of teaching. This reality requires much trial and error and is humbling and often fraught with criticism, both personally and from others. Jamadar's reality met the ideal when her students benefitted from the tutoring she provided. The internal and external challenges she faced in the tutoring process brought her ideals of teaching closer to the realities most teachers encounter.

Walker's autoethnography differs from Jamadar's in that she entered the methods course reporting abject fear of mathematics, as observed in her course-opening painting by Kandinsky (1910). Her analysis of the narratives written throughout the fall 2011 semester demonstrated her understanding of autoethnographic principle. Autoethnography strives to substantively contribute to the understanding of social life, contain aesthetic merit, and demonstrate reflexivity and the level of impact, while expressing a reality (Ellis, 2004). Walker's examination of sixteen weeks of narratives that express her experiences with the tutoring and Fiesta Math Night projects guided her. The social life expressed is that of a mathematics teacher in development who is thrust into a world of delivery of differentiated instruction, in a subject that is both challenging and feared. Her metaphoric descriptions of her ability to come to terms with this nemesis, mathematics learning and teaching, expresses the reality of her initial fears and the strength to overcome these fears found through work with children and parents. The paper is compelling and intriguing as she relates the end of semester art choice as a quilt of peace (Coleman, 2006) that embodies a sense of direction, structure, and personal growth as a teacher of mathematics. She is now eager to make a difference and feels confident that this is possible.

The four papers related to the mathematics-tutoring project, though varied in orientation, demonstrate the importance of the triad of theory, practice, and research as a model for preparing pre-service teachers for tomorrow's students. Advances in the medical profession are made through this model, and in 1988 the Holmes Partnership designed the PDS model after the medical model. The PDS from which the five authors received training embraces the Holmes Model, producing teachers who embody the principles of PDS.

Action Research

In the third large project in the PDS, each intern and mentor teacher completes an action research project. These projects vary based on the observed needs for study in the classroom. Interns serve in various capacities during the research process. Some work with mentor teachers to design the projects, while others assist with data collection and analysis. Teachers and interns work in harmony to prepare the results for public display at the action research Gala Night, sponsored each spring. Projects last six weeks and involve purposeful data collection that informs teachers and interns about the problems under study.

PDS interns complete surveys at the end of the second semester of the PDS detailing the questions, methods, data analysis, findings, and comments related to the completed action research projects. Potter, in her article in this journal section, analyzed and synthesized five years of action research data from the surveys to determine trends across projects. Her examination of over 300 projects led to her deeper development as a teacher. In her role as an undergraduate research assistant using qualitative analysis methodology, she began to learn about the effect of action research on teachers' decision making and the future application of this toward the improvement of her teaching. She also gained insight into the theoretical principles of the PDS

model, through her examination of the NCATE PDS standards. Her work advanced her position as a well-informed, reflective teacher.

Summary

Teachers in the elementary education preparation program at the University of North Texas undergo a unique process that introduces them to the relationship between theory, practice, and research. They are introduced to multiple educational theories in various education courses. These theories are applied in the field during their observation and student teaching semesters during their senior year. In these two semesters, through the three projects described here, students conduct research that is meaningful, insightful, and life-changing, with the goal of developing themselves into responsive teachers.

The five studies completed by undergraduate elementary education students reported in this journal section demonstrate the importance of encouraging and supporting research at the undergraduate level. Their research elevates the teaching profession because reflective, mindful teachers have been shown to stay in the profession longer, are more apt to seek higher levels of professional development, and understand the contributions research makes toward improving the profession (Neapolitan, 2004). Schwartz (2000), in his study of John Dewey, the foremost educational philosopher of the United States, notes that Dewey claimed that action research is important and even critical for the in-service teacher for the purposes of developing better teaching and learning in the classroom. The five studies here demonstrate that the practice of research in the field could profit from initiation at the pre-service/intern level as well.

From an instructional/institutional perspective, research needs to be conducted on these interns as in-service teachers in the field to determine the level of research that is employed post-graduation. Some evidence is available, since approximately 25 percent of the mentor-teachers

working with interns hail from this PDS program. They have each completed action research projects annually, and continue to support mathematics tutoring and Fiesta Math Nights.

However, there is limited knowledge as to why, how, and what makes mentor teachers select the action research projects they choose. Also, there is no knowledge at this time as to whether graduates who have conducted research as undergraduates continue this practice outside the mentor role. Recently, approximately 50 mentor teachers and 35 interns were interviewed in focus groups to determine the whys, hows, and whats of particular action research topics and what actions were taken based on the results of the research. The data from these interviews are currently being analyzed, with the intent of applying the findings to future studies. Learning gained from this work will inform future projects, interns, in-service teachers, and the university/college of education practice of supporting undergraduate research.

References

- Alsalouli, M. (2004). Preservice teachers' beliefs and conceptions about mathematics teaching and learning. Paper presented at the Psychology of Mathematics & Education of North America; Annual Meeting, Toronto, Canada.
- American Educational Research Association. (2012). AERA professional development research special interest group webpage. Retrieved from <http://www.aera.net/SIG079/ProfessionalDevelopmentSchoolResearchSIG79/tabid/11590/Default.aspx>
- Bruce, C. (2004). Building Confidence in Teaching Mathematics: Experiences of Pre-service Teachers that Hinder and Enable Confidence. Paper presented at the Psychology of Mathematics & Education of North America, Toronto, Canada.
- Bursal, M., & Paznokas, L. (2006). Mathematics anxiety and preservice elementary teachers' confidence to teach mathematics and science. *School Science & Mathematics, 106*(4), 173-180.
- Coleman, Michael A. (2006). Square Sierpinski Subdivision Variation #1. Retrieved from <http://miquel.com/crystals.html>.
- Ellis, C. (2004). *The ethnographic I: A methodological novel about autoethnography*. Lanham, Maryland: AltaMira Press.
- Group, T. H. (1986). *Tomorrow's teachers: A report of the Holmes group*. East Lansing, MI: The Holmes Group.
- Group, T. H. (1990). *Tomorrow's schools: Principles for the design of professional development schools*. East Lansing, MI: The Holmes Group.
- Group, T. H. (1995). *Tomorrow's schools of education: A report of the Holmes group*. East Lansing, MI: Holmes Partnership.
- Kandinsky, Wassily. (1910). *Murnau-Garden II*. Retrieved from Art.com
- Levine, M. (2001). Standards for professional development schools. *NCATE PDS Standards*. Retrieved from <http://www.ncate.org/public/standards.asp>
- Marechal, G. (2010). Autoethnography. In A. J. Mills, G. Durepos & E. Wiebe (Eds.), *Encyclopedia of Case Study Research* (Vol. 2, pp. 43-45). Thousand Oaks, CA: Sage Publications.
- Montejano, S., & Tunks, J. (2010). Make a move: Creating a culturally aware community of masters and scholars. *The Eagle Feather, 7*, 1-15. Retrieved from

<http://web3.unt.edu/honors/eaglefeather/2010/make-a-move-creating-a-culturally-aware-community-of-masters-and-scholars/>

- National Association of Professional Development Schools. (2010). National Association of Professional Development Schools. Retrieved from <http://www.napds.org/>
- National Commission of Excellence in Education. (1983). *A nation at risk: The imperative for educational reform*. Washington, D.C.: National Commission of Excellence in Education.
- Neapolitan, J. (2004). *Traditions, Standards & Transformations: A Model for Professional Development Schools*. New York, New York: Lang.
- Rule, A. C., & Harrell, M. H. (2006). Symbolic Drawings Reveal Changes in Preservice Teacher Mathematics Attitudes After a Mathematics Methods Course. *School Science & Mathematics, 106*(6), 241-258.
- Schwartz, W. (2000). *The Impact of Professional Development Schools on the Education of Urban Students*. Washington, D.C.: ERIC Clearinghouse on Urban Education.
- Swars, S. L. (2005). Examining Perceptions of Mathematics Teaching Effectiveness among Elementary Preservice Teachers with Differing Levels of Mathematics Teacher Efficacy. *Journal of Instructional Psychology, 32*(2), 139-147.
- Tunks, J., & Bain, C. (2009). Art as metaphor: The reconciliation of PDS preservice teachers' perception of mathematics learning and teaching. Paper presented at the American Association for Teaching and Curriculum.
- Tunks, J., & O'Brien, C. (2010). *Tutoring in mathematics: Affect on PDS candidates' perception of teaching mathematics and effect on student achievement*. Paper presented at the 6th Mixed Methods International Conference.
- Utle, J., & Showalter, B. (2007). Preservice Elementary Teachers' Visual Images of Themselves as Mathematics Teachers. *Focus on Learning Problems in Mathematics, 29*(3), 1-14.
- Zacharos, K., Koliopoulos, D., Dokimaki, M., & Kassoumi, H. (2007). Views of prospective early childhood education teachers towards mathematics and Its instruction. *European Journal of Teacher Education, 30*(3), 305-318.