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Preservice Elementary Teachers' Self-Efficacy Beliefs About Equitable Science Teaching: Does Service Learning Make a Difference?

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Abstract

This pilot study investigated the effect of community-based service learning on the self-efficacy beliefs of preservice elementary teachers in regards to equitable science teaching and learning. Using the Self-Efficacy Beliefs About Equitable Science Teaching (SEBEST) instrument (Ritter, Boone, & Rubba, 2001), pre- and posttest data from 32 preservice elementary teachers who were enrolled in two different science methods courses were analyzed. Findings from this study suggest that community-based service learning significantly influenced preservice elementary teachers' outcome expectancy toward equitable science teaching and learning.

Introduction

Research indicates that despite the number of science and multicultural education courses taken, preservice teachers continue to enter their student teaching semesters and professional careers with low science teaching efficacy beliefs and with beliefs about diversity that undermine the equity principle articulated in science reform initiatives (Banks, 2006; Boyle-Baise, 2002; Tosun, 2000). In the face of an increasingly diverse school-aged population, if a goal of elementary teacher education programs is to produce teachers who are equipped to reduce the science achievement gap that exists between diverse learners, science teacher educators must determine what practices positively influence preservice teachers' self-efficacy beliefs about equitable science teaching and learning. Although existing research has examined preservice teachers' self-efficacy in regards to teaching students in urban settings (Wade, 1995), no research has examined the effects of community-based service learning (CBSL) on preservice elementary teachers' science teaching efficacy regarding equitable teaching and learning. This pilot study seeks to advance science teacher educators' knowledge by providing insight into science teacher education practices that positively effect self-efficacy beliefs about equitable science teaching and learning. More specifically, the following two research questions guided this pilot study:

1. What effect does community-based service learning have on preservice elementary teachers' personal self-efficacy and outcome expectancy beliefs in regards to equitable science teaching and learning?

2. What effect does a traditional university-based course have on preservice elementary teachers' personal self-efficacy and outcome expectancy beliefs in regards to equitable science teaching and learning?

Conceptual Framework

Teacher efficacy has been linked to educational outcomes such as student motivation and student achievement (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Consequently, current science education reform initiatives have focused on improving preservice teacher preparation (National Research Council [NRC], 1996; National Science Teacher Association [NSTA], 2003, 2004). Underscoring the importance of self-efficacy and science teacher education reform, Czerniak and Chiarelott (1990) contend that "science anxiety and efficacy and strategies that reduce anxiety and increase efficacy are worthy of attention in teacher education if we wish to improve the quality, quantity, and success of science curriculum and instruction" (p. 55). Bandura's (1997) social cognitive theory provides the conceptual framework for examining the constructs of personal self-efficacy and outcome expectancy.

Science Teaching Efficacy

Bandura (1977, 1997) defined *self-efficacy* as a situation-specific construct that is concerned with how an individual judges his or her ability to organize and successfully perform the behaviors that are necessary to handle prospective situations. Self-efficacy has been divided into two cognitive constructs: (1) personal self-efficacy and (2) outcome expectancy. *Personal self-efficacy* is defined as "judgments about how well one can organize and execute courses of action required to deal with prospective situations that contain ambiguous, unpredictable, and often stressful elements" (Bandura, 1977, p. 201). *Outcome expectancy* is "a person's estimate that a given behavior will lead to certain outcomes" (p. 201). Bandura noted that individuals who possess a low sense of self-efficacy have low aspirations, have weak commitments to goals, dwell on personal deficiencies, and shy away from difficult tasks. On the other hand, those individuals who possess a strong sense of self-efficacy set challenging goals while maintaining a strong commitment to them. They face failures and setbacks by redefining their efforts. Furthermore, these individuals approach challenging tasks as assignments to be conquered rather than as threats to be avoided.

Scaffolding off of Bandura's (1977, 1997) social cognitive theory, Enochs and Riggs (1990) applied the constructs of personal self-efficacy and outcome expectancy to the study of science teaching. They predicted that science teachers who believed student learning could be influenced by effective teaching (outcome expectancy) and were confident in their own teaching abilities (personal self-efficacy) would persist longer, provide increased academic focus in the classroom, and exhibit a repertoire of ideas and strategies as opposed to teachers with low self-efficacy. Lumpe, Haney, and Czerniak (2000) confirmed the aforementioned prediction. They found that teachers with high self-efficacy implemented inquiry-based activities, whereas teachers with low self-efficacy transmitted knowledge through a fact-based curriculum.

Science Teaching Efficacy and Diversity

Research indicates that racial/ethnic minorities and low-income students are often assigned to lower track classrooms (Atwater, 2000). At the same time, the teachers who are charged with instructing these students often possess low self-efficacy (Raudenbush, Rowan, & Cheong, 1992). Teachers' low self-efficacy beliefs are reflected in the limited amount of time spent teaching science and the dissemination of a fact-based curriculum absent of meaningful science content (Gilbert & Yerrick,

2001; Weiss, 1997). Without meaningful content, many students are unable to make connections between science content and their everyday lives. This may be one of the reasons why students of color and of low income continue to lag behind in science achievement scores. In 4th grade, students in central city locations had lower average scores than those in urban fringe/large town or rural/small town locations (National Center for Educational Statistics [NCES], 2003). Similarly, of those 4th-grade students who were eligible for free/reduced lunch, 58% remained below the basic level for science achievement.

Another possible reason for the science achievement gap between racial/ethnic minorities and low-income students and their White, middle class peers is that many teachers subscribe to the belief that very few students—especially students of color—can be successful in science-related fields (Atwater, 2000; Gilbert & Yerrick, 2001). In a survey of 300 White preservice teachers at Kutztown University regarding their beliefs about working in multicultural settings, Shultz, Nyehart, and Reck (1996) found that many held negative perceptions of diverse student groups. The majority of preservice teachers described urban students as lackadaisical, unmotivated, violent, and emotionally unstable.

In their ethnographic study, Gilbert and Yerrick (2001) discovered that the pedagogical practices of a White male teacher marginalized diverse student groups. The teacher's beliefs about the lack of knowledge possessed by minority students underpinned his choice to represent science through watered-down curriculum by disseminating fact-based information absent of meaningful content. Similarly, in a study conducted by Burstein and Cabello (1989), 38% of the certified teachers sampled described diverse student groups as coming from a "deficient" background as opposed to a "different" background (p. 12). Cognizant of the interrelatedness of teacher beliefs about science teaching and learning and diversity, Ritter et al. (2001) developed the Self-Efficacy Beliefs About Equitable Science Teaching (SEBEST) instrument to assess the self-efficacy beliefs of preservice elementary teachers regarding science teaching and learning for diverse learners. This instrument was used in this study.

Service Learning as a Source of Efficacy

Bandura (1997) contends that there are four sources from which people collect information: (1) mastery experiences, (2) vicarious experiences, (3) physiological and emotional states, and (4) social persuasion. Of these four sources, mastery experiences are considered to be the most powerful in influencing self-efficacy. *Mastery experiences*, within the context of elementary teacher education programs, are those instances where preservice teachers are provided with opportunities to teach. If preservice teachers perceive that their teaching experiences have been successful, they are more likely to teach again. However, if preservice teachers perceive that they have failed at teaching, this perception tends to lower their sense of self-efficacy, especially when failure cannot be ascribed to a lack of effort or external variables.

Research findings on the outcomes of mastery experiences confirm their promise in enhancing teaching efficacy (Cannon & Scharmann, 1996; Enochs & Riggs, 1990; Wade, 1995; Waters & Ginns, 2000). As a result, mastery experiences, such as community-based service learning (CBSL), are becoming ever more important. CBSL is a student-centered pedagogy that connects authentic, meaningful service with academic study and reflection (Eyler & Giles, 1999). It enhances academic learning by allowing preservice teachers with opportunities to link academic

theories to practice while engaging them in activities that address community needs. Additionally, preservice teachers participating in CBSL report higher self-efficacy and are more likely to feel as though they can address the substantial diversity in students' background experiences that they bring with them to the classroom (Darling-Hammond, 1996; Wade, 1995).

Four important elements of CBSL were used to frame this study: (1) diversity, (2) academics, (3) reciprocity, and (4) reflection (Wade, 1995). First, the *diversity element* provided an environment for preservice teachers to interact with and get to know diverse elementary student groups. Second, the *academics element* allowed preservice teachers with the opportunity to apply the knowledge and skills acquired during their science teacher education coursework to real-life situations (e.g., tutoring). Third, the *reciprocity element* not only allowed preservice teachers to practice teaching but it emphasized the importance of providing services that explicitly reflected the community's needs. For the community center, CBSL facilitated the development of elementary students' higher-order critical thinking skills. Helping students to develop these skills was very important to the community center's director. Finally, structured opportunities for preservice teachers to reflect on their CBSL experience (the *reflection element*) were facilitated through the use of activities and discussions during each course meeting. For example, after implementing their science lessons, preservice teachers were required to reflect upon what worked, what didn't work, and what major changes they would make if the lessons were to be taught again.

Methodology

Participants

Preservice Teachers

The participants were preservice teachers who self-registered for two science methods courses. During the first meeting, the preservice teachers were informed about the difference between the two courses. If preservice teachers did not want to participate in CBSL, they were allowed to transfer or withdraw without penalty. After transfers and withdrawals, a total of 32 preservice teachers between the two courses consented to take part in the study. The total sample consisted of 32 females. The majority of participants (24 teachers) were juniors, and the rest were seniors. The racial/ethnic composition was as follows: 28 were White/Caucasian, two were Black/African American, and two were Hispanic/Latina.

Instructor

The instructor was the same for both courses. The instructor was a White, monolingual, middle-class female with science and science education teaching experience in secondary public schools and universities.

Elementary Students

Approximately 38 elementary school students participated in the tutoring program. The word "approximately" is used because the number of students varied due to the high mobility rates of the surrounding community. Twenty-five students were female, and 13 were male. The racial/ethnic composition of

the students was as follows: 24 were Black/African American, eight were White/Caucasian, five were Hispanic/Latino, and one was Indian/Native American. Twenty-seven students were from low-income households (University Area Community Development Corporation [UACDC], 2005).

Science Methods Courses

The study was conducted at a university in the southeastern United States. As part of the elementary teacher education program, preservice teachers are required to take one elementary science methods course. In this study, one of the methods courses was housed at the university's main campus, while the other was housed at an urban neighborhood community center located in an area near the university's main campus. The overall purpose of both methods courses was to introduce preservice elementary teachers to how children learn science and why science education is important. The courses were taught in the Fall of 2005 for 15 weeks, and they examined topics such as science process skills, assessment strategies, students' misconceptions of science, and inquiry-based learning. The textbook used in both courses was *Science Stories*: *A Science Methods Book for Elementary School Teachers* (Koch, 2002).

In both courses, the professor modeled effective ways of implementing inquiry-based science lessons with elementary students. For example, she showed preservice teachers how to link science content to prior knowledge and how to facilitate the development of students' critical thinking skills with the utilization of open-ended questions after the hands-on portion of the lesson was completed. Preservice teachers were then required to connect the knowledge gained from their observations of the professor and their understanding of effective science teaching practices to teaching itself. In the university-based course, preservice teachers were required to teach two inquiry-based science lessons during the semester, usually in pairs, with their peers as the students. Peer teaching was not required of preservice teachers who participated in the CBSL course. Instead, preservice teachers were required to implement their inquiry-based science lessons on a weekly basis with diverse elementary student groups on a two-to-three basis (two preservice teachers to every three elementary students).

Elementary students were usually assigned to preservice teachers by grade level (e.g., 1st graders and 2nd graders) and race/ethnicity whenever possible. For example, White/Caucasian preservice teachers may have been paired with three 1st-grade students from racial/ethnic backgrounds different from themselves. At the end of each course meeting, the instructor required preservice teachers to debrief and orally reflect upon their experiences. These debriefings included issues that ranged from science activities gone wrong to how to encourage participation of students who were disengaged from the science activities. The purpose of these debriefing sessions was not to reach a definitive conclusion, but to challenge preservice teachers to critically reflect on their teaching practices and the modifications that may be necessary to effectively teach science to diverse student groups. No other differences were noted between sections.

Instrumentation

The SEBEST instrument developed by Ritter et al. (2001) was used for the pre- and posttests. The SEBEST instrument is a modification of the Science Teaching Efficacy Beliefs Instrument Form B (STEBI-B) (Enochs & Riggs, 1990) and consists of 34 items that assess the self-efficacy beliefs of preservice teachers with regards

to science teaching for diverse students. Ritter et al. (2001) define diverse learners as those groups who are underrepresented in science-related fields (e.g., racial/ethnic minorities and females) and those from low socioeconomic status (SES) backgrounds.

The SEBEST instrument measures two subscales: (1) Personal Science Teaching Efficacy (PSTE) and (2) Science Teaching Outcome Expectancy (STOE). The PSTE subscale consists of 17 items that question preservice teachers about their perceived ability to affect student outcomes based on sociocultural factors such as students' race/ethnicity, gender, language, and SES. The STOE subscale consists of 17 items that assess preservice teachers' beliefs that, provided with effective teaching, student outcomes can be positively affected, irrespective of sociocultural background. Each item was linked to a five-choice Likert-scale response ranging from "strongly agree" (5) to "strongly disagree" (1). Possible scores, on each subscale, ranged from 17 to 85. Examples of the items from Ritter et al. (2001) are presented in Table 1.

Table 1. Examples of Items in the SEBEST Instrument

PSTE Subscale	I will be able to meet the learning needs of children of color when I teach science.
	I will have the ability to help children from low socioeconomic backgrounds be successful in science.
STOE Subscale	Children of color can succeed in science when proven science teaching strategies are employed.
	Effective science teaching can help children from low socioeconomic backgrounds overcome hurdles to become good science learners.

Ritter et al. (2001) conducted many studies to examine the reliability and construct validity of the SEBEST instrument. In the first study, the SEBEST instrument was administered to 217 preservice elementary teachers. The coefficient alpha reliability for the entire study was 0.87. Based on this sample, the reliability for the 17-item PSTE subscale was 0.83, and it was 0.78 for the 17-item STOE subscale. These statistics suggest that the SEBEST instrument is a reliable test.

Data Analysis

The raw data from the pre- and posttests were aggregated and compared within groups to determine if there were particular outcome patterns between pre- and posttest scores on both the PSTE and STOE subscales in the respective courses. Table 2 shows the mean scores for each subgroup before and after the science methods courses.

Due to the small sample size and the fact that participants self-registered for their respective methods course, homogeneity of variances was not assumed. The nonparametric Wilcoxon matched pairs test was performed on the data from participants completing both tests. Upon analysis, results indicated that CBSL had a significant effect on participants' outcome expectancy ($p = 0.05$). However, a nonsignificant effect was noted for participants' personal self-efficacy ($p = 0.81$). The results of the Wilcoxon for the university-based course indicated that participants' personal self-efficacy ($p = 0.35$) and outcome-expectancy ($p = 0.26$) were not significantly affected.

Table 2. Mean PSTE and STOE Scores on SEBEST Instrument

PSTE					
		Pretest		Posttest	
Methods Course	N	M	SD	M	SD
Community-based	17	71.06	7.38	70.65	7.26
University-based	15	73.33	6.40	74.87	7.49
STOE					
		Pretest		Posttest	
Methods Course	N	M	SD	M	SD
Community-based	17	73.88	6.34	76.88*	7.23
University-based	15	77.00	7.76	78.87	6.23

*p = 0.05 significant difference

Discussion and Implications

The purpose of this study was to investigate the change in preservice elementary teachers' SEBEST after participating in CBSL. Results indicated that CBSL had a significant positive effect on preservice teachers' STOE; however, CBSL did not have a significant effect on preservice teachers' PSTE. In contrast, there was no significant increase in STOE or PSTE of the preservice teachers who did not participate in CBSL. These findings suggest that after participating in CBSL, preservice teachers were confident that with effective science teaching, diverse student groups could be academically successful in science (STOE). Although both courses incorporated mastery experiences (i.e., tutoring experiences with diverse student groups or microteaching with peers), preservice teachers' beliefs about students' abilities to learn science were positively impacted when they were able to directly observe elementary students successfully carrying out science activities. This finding is consistent with previous studies documenting the positive effects of service learning (Eyler & Giles, 1999; Wade, 1995) and site-based tutoring experiences (Wingfield, Freeman, & Ramsey, 2000) on preservice teachers' self-efficacy. Specifically, Wingfield et al. (2000) concluded that preservice teachers' STOE beliefs were positively influenced by their successful teaching experience with elementary students.

Despite the significant increase in STOE, CBSL did not have a significant effect on preservice teachers' PSTE. PSTE is an individual's belief in his or her ability to teach science to diverse student groups. One possible explanation for this finding is that, according to researchers (Pajares, 1996), beliefs about teaching, which include self-efficacy and perceptions about what it takes to be an effective science teacher of diverse student groups, are well-formed before preservice teachers enter elementary teacher education programs. If such beliefs are deeply entrenched, PSTE may be more resistant to change.

Given the strong relationship that exists between teacher efficacy, instructional practices, and student achievement (Tschannen-Moran et al., 1998), there is need to determine what teacher education practices will facilitate the development of teachers who are confident in their ability to teach science and who believe that with effective teaching, diverse student groups can be successful in science. In order to foster the development of these beliefs, Professional Development Standard B (NRC, 1996) states that "learning experiences for teachers of science must occur in a variety of places where effective science teaching can be illustrated

and modeled, permitting students to struggle with real situations and expand their knowledge and skills to appropriate contexts" (p. 62). On a similar note, Darling-Hammond (1996) and Barton (2000) suggest that preservice teachers be provided with opportunities to interact with ethnically and culturally diverse students in authentic environmental settings. The results of this pilot study point to a link between increased STOE and CBSL. These findings have important implications for practitioners and recommendations for future research.

First, the ultimate purpose of CBSL is to produce critically conscious citizens who are able to affect change and give a voice to those who have been silenced. For teachers, this translates into critically analyzing important issues in regards to race, ethnicity, culture, power, class, and language and recognizing how these factors shape not only their beliefs but also the beliefs of many students, especially students of color. If science teacher educators do not provide preservice teachers with opportunities to reflect on their beliefs and practices, diverse student groups will continue to lag behind in science achievement scores (NCES, 2003), and the goal of scientific literacy for all will not be achieved. Therefore, science teacher educators should consider making CBSL available to preservice teachers earlier in college programs.

Second, since few teachers live in neighborhoods similar to those of their students (Ladson-Billings, 1994), they often have little to no knowledge of what to expect from students who come from different sociocultural backgrounds than themselves. Thus, addressing the needs of students from diverse backgrounds, a characteristic of many urban schools, is something preservice teachers indicate they feel least prepared to handle. Since the elementary science methods courses hold the most promise in affecting positive changes in preservice teachers' science teaching efficacy (Enochs & Riggs, 1990), science teacher educators should integrate CBSL in their course structure, making sure preservice teachers are matched with students who are significantly different from themselves in terms of race, ethnicity, culture, language, and SES. It might also be suggested that CBSL be integrated into practica throughout preservice teachers' education coursework. This will better prepare preservice teachers to close the science achievement gap.

Finally, although it may be argued that small group instruction in a nonschool setting is unrealistic in the U.S. education system and creates a disconnect between the reality of public schools and the ideal world that is created as preservice teachers matriculate through their teacher education coursework, these types of experiences should be required components of teacher education courses. Small group instruction utilizing nonschool settings provides preservice teachers with the opportunity to interact with diverse student groups without the restrictions imposed by traditional school structures and hierarchies (Irvine, 2003). It also allows preservice teachers the opportunity to refine their pedagogical skills and increase their self-efficacy. This is important because some researchers have found that self-efficacy declines after the first year of teaching (Tschannen-Moran et al., 1998). However, if preservice teachers' science teaching efficacy beliefs are high at the end of their teacher education program, they are more likely to maintain this high self-efficacy level at the end of their first year of teaching (Wingfield et al., 2000). Since the preservice teachers in this study demonstrated higher levels of STOE after participating in CBSL, more research is needed in order to determine the durability of these changes, particularly in diverse school settings.

Due to the small sample size used in this study, generalizability is limited. Therefore, caution must be used when comparing the results of this study to other populations. Additional research using a larger sample size is being conducted to

further determine the effects of CBSL on preservice teachers' self-efficacy using the SEBEST instrument.

References

Atwater, M. M. (2000). Equity for black Americans in precollege science. *Science Education*, *84*, 154-179.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman and Company.

Banks, J. A. (Ed.). (2006). *Cultural diversity and education: Foundations, curriculum, and theory* (4th ed.). Boston: Allyn & Bacon.

Barton, A. C. (2000). Crafting multicultural science education with preservice teachers through service-learning. *Journal of Curriculum Studies*, *32*(6), 797-820.

Boyle-Baise, M. (2002). *Multicultural service learning: Educating teachers in diverse communities*. New York: Teachers College Press.

Burstein, N. D., & Cabello, B. (1989). Preparing teachers to work with culturally diverse students: Another educational model. *Journal of Teacher Education*, *54*, 9-16.

Cannon, J. R., & Scharmann, L. C. (1996). Influence of a cooperative early field experience on preservice elementary teachers' science self-efficacy. *Science Education*, *80*, 419-436.

Czerniak, C., & Chiarelott, L. (1990). Teacher education for effective science instruction: A social cognitive perspective. *Journal of Teacher Education*, *41*(1), 49-58.

Darling-Hammond, L. (1996). What matters most: A competent teacher for every child. *Phi Delta Kappan*, *78*(5), 193-203.

Enochs, L. G., & Riggs, I. M. (1990). Further development of an elementary science teaching efficacy belief instrument: A preservice elementary scale. *School Science and Mathematics*, *90*(8), 694-706.

Eyler, J. S., & Giles, D. E., Jr. (1999). *Where's the learning in service-learning?* San Francisco: Jossey-Bass.

Gilbert, A., & Yerrick, R. (2001). Same school, separate worlds: A sociocultural study of identity, resistance, and negotiation in a rural, lower track science classroom. *Journal of Research in Science Teaching*, *38*(5), 574-598.

Irvine, J. J. (2003). *Educating teachers for diversity: Seeing with a cultural eye*. New York: Teachers College Press.

Koch, J. (2002*). Science stories: A science methods book for elementary school teachers* (2nd ed.). Boston: Houghton Mifflin Company.

Ladson-Billings, G. (1994). Who will teach our children? Preparing teachers to teach African American learners. In E. Hollings, J. King, & W. Hayman (Eds.), *Teaching diverse learners: Formulating a knowledge base for teaching diverse populations (*pp. 129-158). Albany: State University of New York Press.

Lumpe, A. T., Haney, J., & Czerniak, C. (2000). Assessing teachers' beliefs about their science teaching context. *Journal of Research in Science Teaching*, *37*, 123-145.

National Center for Educational Statistics (NCES). (2003). *The condition of education 2003*. Washington, DC: U.S. Department of Education.

National Research Council (NRC). (1996). *National science education standards* (*NSES*). Washington, DC: National Academy Press.

National Science Teachers Association (NSTA). (2003). *Standards for science teacher preparation*. Washington, DC: Author.
NSTA. (2004). *Position statement on science teacher preparation*. Arlington, VA: Author.
Pajares, F. (1996). Self beliefs in academic settings. *Review of Educational Research*, *66*, 543-578.
Raudenbush, S., Rowan, B., & Cheong, Y. F. (1992). Contextual effects on the self-perceived efficacy of high school teachers. *Sociology of Education*, *65*, 150-167.
Ritter, J. M., Boone, W. J., & Rubba, P. A. (2001). Development of an instrument to assess prospective elementary teacher self-efficacy beliefs about equitable science teaching and learning. *Journal of Science Teacher Education, 12*(3), 175-198.
Shultz, E., Nyehart, T., & Reck, U. (1996). Swimming against the tide: A study of prospective teachers' attitudes regarding cultural diversity and urban teaching. *Western Journal of Black Studies*, *20*(1), 1-7.
Tosun, T. (2000). The beliefs of elementary science teachers toward science and science teaching. *School Science and Mathematics*, *100*(7), 374-379.
Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68*(2), 202-248.
University Area Community Development Corporation. (2005). *Annual report 2005.* Retrieved April 27, 2009, from http://uacdconline.org/uacdc/AnnualReport2005.pdf.
Wade, R. C. (1995). Developing active citizens: Community service learning in social studies teacher education. *Social Studies*, *86*(3), 122-128.
Waters, J. J., & Ginns, I. S. (2000). Developing motivation to teach elementary science: Effect of collaborative and authentic learning practices in preservice education. *Journal of Science Teacher Education*, *11*(4), 301-321.
Weiss, I. R. (1997). Comparing teacher views and classroom practice to national standards. *National Institute for Science Education Brief*, *1*(3), 1-11.
Wingfield, M. E., Freeman, L., & Ramsey, J. (2000, April). *Science teaching self-efficacy of first year elementary teachers trained in a site based program*. Paper presented at the annual meeting of the National Association for Research in Science Teaching, New Orleans, LA. (ERIC Document Reproduction Service No. ED439956)

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