The Effects of a Cooperative Learning Field Experience on Views of Inquiry-Based Science and Science Teaching Self-Efficacy: A Pre-service Teacher’s Action Research

Kristina SOPRANO
School of Education, Roger Williams University
Bristol, RI 02809, USA

Li-Ling YANG
School of Education, Roger Williams University
Bristol, RI 02809, USA

ABSTRACT

This study reports the effects of a cooperative learning field experience on a pre-service teacher’s views of inquiry-based science and her science teaching self-efficacy. Framed by an action research model, this study examined (a) the pre-service teacher’s developing understanding of inquiry-based science teaching and learning throughout the planning and implementation phases of the field experience and (b) the pre-service teacher’s inquiry-based science teaching self-efficacy beliefs prior to and after the field experience. The pre-service teacher’s self-reflections before and after the field experience, video reflections and results from the Science Teaching Efficacy Beliefs Inventory (STEBI-B) form were analyzed in this study. The findings revealed that (a) the pre-service teacher’s understandings of inquiry-based science teaching and learning were developed and enhanced throughout the planning and teaching phases of the field experience, and (b) the pre-service teacher’s science teaching self-efficacy beliefs were improved as a result of a stronger appreciation and understanding of inquiry-based science teaching and learning. Further implications for scholarly significance and professional development are discussed.

Keywords: Inquiry-Based Science, Self-Efficacy, Pre-Service Teacher, Action Research, Elementary School Science

OBJECTIVES

The purpose of this study is to examine the effects of a cooperative learning field experience on a pre-service teacher’s views of inquiry-based science and her science teaching self-efficacy. Research questions include: (a) What is the pre-service teacher’s understanding of inquiry-based science throughout the planning and implementation phases of the field experience? and (b) How do the pre-service teacher’s inquiry-based science teaching self-efficacy beliefs prior to and after the field experience compare?

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Action Research

As defined by Kemmis (1982), “action research in education is a term used to describe a family of activities in curriculum development, professional development, school improvement programs, and systems planning and policy development” (as cited in Parsons & Reynolds, 1995, p. 3) [14]. No matter the focus, Kemmis (1982) indicates that “action research aims to improve in three areas: the practice, the understanding of the practice by its practitioners, and the situation in which the practice takes place” (as cited in Parsons & Reynolds, 1995, p. 4) [14]. Moreover, teachers can conduct action research projects to actually test a teaching strategy, instructional materials or curricula with their students to track their effectiveness (Akerson & McDuffie, 2002; Cullen et al., 2010) [1],[6].

Most teachers regularly examine and reflect upon their practices as part of their usual teaching procedures. Briscoe and Wells (2002) and Lylle and Cochran-Smith (1990) indicate that “action research can bridge the gap between theory and practice because it helps teachers to understand the purpose of educational research and in turn, informs educational theory of the reality of the classroom” (as cited in Kang, 2007, p. 472) [8]. Similarly, Akerson and McDuffie (2002) further describe action research as “inquiry into one’s own teaching”, as it “promises to give teachers an authentic experience in inquiry on their own science teaching as a professional development tool” (p. 5) [1].

Many teacher-researchers have identified the benefits of action research in the classroom to include heightened self-efficacy, increased reflection and responsiveness and enhanced motivation for teaching (Megowan-Romanowicz, 2010; Cullen et al., 2010; Lebak & Tinsley, 2010) [10],[6],[9].

Furthermore, in a study examining the effects of a teacher-action research professional development program, Cullen et al. (2010) reported that teachers had an improved view of themselves as teachers after conducting action research on their classroom instruction [6]. They also noticed that after the action research, teachers were more inclined to advocate for themselves and their students.

Just as it benefits in-service teachers, action research is a helpful tool for pre-service teachers to explore and learn new teaching methods, as they regularly monitor the effectiveness of their developing teaching practices. Capobianco and Feldman (2010) stress that it is important for teachers to adjust to the ongoing standards and accountability changes in science education [3]. They suggest that pre-service teacher action research could serve as a viable means to both address and embrace these changes. Capobianco and Feldman (2010) also suggest that the “...role of scientific inquiry, scientific research practices, and evidence-based claims in the science classroom are just a few examples of the changing landscape in science education” (p. 913) [3]. They claim that addressing these changes through action research will make teacher experiences and practices more visible and open to analysis, providing constructive avenues for educational change. Similarly, Goodnough (2010) notes that through action research, pre-service and in-service teachers become “researchers and knowledge creators, engaging in systematic inquiry into their own experience and critically using formal knowledge to inform their inquiry and help interpret findings” (p. 920) [4].

Studies examining the benefits of pre-service action research claim that it is a necessary component to preparing teachers to be effective practitioners (Capobianco & Feldman, 2010; Goodnough, 2010; Megowan-Romanowicz, 2010; NRC, 2000) [3],[4],[10]. However, there is a paucity of published pre-service action research and the addition of studies from the direct point of view of the pre-service teacher may provide valuable insight into the effectiveness of teacher education programs.

Inquiry-Based Science

Akerson and McDuffie (2002) define inquiry as “raising an investigative question, developing methods to answer that question, carrying out those methods, analyzing the data, and reporting the findings and making conclusions” (p. 3) [1]. The National Science Education Standards (NRC, 1996) include specific content standards on inquiry abilities and understanding of inquiry. The Standards indicate that

Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. Inquiry also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as understanding of how scientists study the natural world (p. 23) [12].
A study by Bleicher and Lindgren (2005) indicates that providing the time necessary for students to “see science” and "do science" are the most important factors in developing their understanding (p. 214) [2]. The importance of guided inquiry, especially at the introductory level, is such that it helps students develop knowledge and conceptual understanding. This understanding allows students to dig more deeply into key ideas (NRC, 2000) [12]. By observing the changes in student achievement and the classroom environment after inquiry-based teaching is implemented, teachers can imitate changes according to their curriculum or school policies (Goodnough, 2010) [4].

For inquiry instruction to be effective however, teachers must first experience inquiry-based approaches. The National Research Council (2000) indicates that, “pre-service or graduate courses and in-service workshops are...the most prevalent formats for teachers to develop and improve their inquiry teaching” (p. 104) [12]. Accordingly, it is crucial for teacher education programs to embrace an instructional inquiry-based sequence (NRC, 2000) [12]. Without formal experience in inquiry-based teaching and learning in teacher preparation programs, in-service teachers either omit inquiry-based teaching, or rely on professional development programs to gain an understanding of inquiry-based science (Lebak & Tinsley, 2010; NRC, 2000) [9], [12]. Ensuring that teachers are confident that inquiry-based teaching methods will help address the science literacy needs of all students (NRC, 2000) [12].

Self-Efficacy
Bandura (1981) reviewed evidence across studies and concluded that perceived self-efficacy contributes significantly to the level of motivation and performance accomplishments” (Bandura, 1977, as cited in Bleicher & Lindgren, 2005, p. 208) [2]. One-step towards increasing self-efficacy among teachers is to consider how teacher motivation will translate to increased student motivation as well. Similarly, Bleicher and Lindgren (2005) indicate that beliefs about the effects of teaching on student achievement will influence teachers' self-efficacy beliefs [2]. In terms of science-teaching self-efficacy, Palmer (2006) found that pre-service teachers' self-efficacy was substantially increased after taking a science methods course, and this was reinforced by having the opportunity to teach science in a practicum [14].

METHODS

Setting
The setting for this action research study was a cooperative learning field experience within an undergraduate science methods course. The field experience took place in a program called, Saturday Ocean Sciences Institute at a liberal arts university in the northeast. Twenty-one pre-service teachers, forming four cooperative groups, developed a four-week ocean sciences unit. During the four-week institute, elementary students came to the university on Saturday mornings to participate in hands-on, "minds-on" science activities exploring ocean sciences. During the planning stages of this institute, one pre-service teacher became interested in the ways this experience affected her views of inquiry-based science and her own self-efficacy with respect to teaching science. This action research was developed as a means of professional development and further inquiry into her own practices.

Data Sources
Data sources for this study include written self-reflections, a video reflection and a completed Science Teaching Efficacy Beliefs Inventory (STEBI-B). The pre-service teacher kept a journal of reflections throughout the planning phase. Prior to implementation, the pre-service teacher referred to this journal to create a comprehensive self-reflection. This reflection captured the researcher’s understandings of inquiry-based science and beliefs science teacher’s self-efficacy that she developed through planning for the field experience.

One post-teaching reflection was written which captures the pre-service teacher’s thoughts immediately following the teaching experience. Both comprehensive reflections were used to compare the pre-service teacher’s self-efficacy beliefs and understanding of inquiry-based science before and after teaching.

Self-Reflections were analyzed based on the techniques developed by Strick and Corbin (1990) [15]. The pre-service teacher and her science methods course instructor were first engaged in analysis of the reflections individually. Statements within the reflectionions were coded as either indicative of commendation/success in teaching and implementation of or instructional/ pedagogical challenges/difficulties regarding the following areas: (1) understanding of inquiry-based science teaching and learning, and (2) science teaching and learning self-efficacy beliefs. They then shared their preliminary analysis to triangulate their coding by “reading, re-reading, and reflecting upon the significant statements” in the reflections (Creswell, 1998, p. 281) [5]. As a final validation, each researcher reviewed the triangulated coding as a final validation.

Video recordings of the teaching experience were viewed and analyzed based on the inquiry processes observed. A coding system that reflects the Five Essential Features of Inquiry Teaching And Learning Across All Grade Levels was developed to analyze the video reflections (NRC, 2000) [12]. The coded video reflections were then used to determine the types of inquiry-based instruction used most frequently during the teaching experience.

The Science Teaching Efficacy Beliefs Inventory STEBI-B designed by Enochs and Rigby (1991) to measure pre-service teachers on science self-efficacy and science teaching outcome expectancy (as cited in Cannon and Scharmann, 1996) was implemented in this study [16]. The instrument, including 13 statements, was implemented once during the planning stages and once immediately following the teaching experience. Data collected was analyzed by comparing the results before and after teaching, and then deciding if the change was positive, negative or neutral in relation to the pre-service teacher’s science teaching self-efficacy beliefs.

RESULTS AND DISCUSSION

Understanding of Inquiry-Based Science Teaching and Learning

Self-Reflections: Reflections were analyzed by comparing the number of statements that were indicative of success in teaching and implementation to the number of statements that were indicative of instructional/pedagogical challenges or difficulties that were written before and after teaching. Table 1 compares the most representative statements of the pre-service teacher’s understanding of inquiry-based science before and after teaching.

The biggest challenge noted prior to teaching was choosing the appropriate inquiry activities. The team teachers had many ideas, but most were not inquiry based. Being able to shift activities to be more inquiry-based suggested the pre-service teacher had at least a basic understanding of the characteristics of an inquiry-based lesson prior to implementation.

The post-teaching reflection analysis revealed many statements that reflected success in implementation which specifically referred to the pre-service teacher’s experiences with new inquiry-based teaching methods. Specifically, the pre-service teacher suggests that guiding and questioning students is helpful in monitoring student learning and understanding. This statement implies that the pre-service teacher has discovered that she can facilitate students’ cognitive inquiry by guiding the learning experience with open-ended questions.

In addition, the pre-service teacher indicated that she had to think quickly while teaching to ask engaging questions that met the needs of her students. This reflection suggests that the pre-service teacher found that active reflection while teaching as a means of formative assessment not only improves students’ understanding but benefits her own development as a teacher as well.

The statement written post-teaching that indicated instructional challenges was in reference to an activity that was not implemented as planned. The pre-service teacher overestimated students’ prior knowledge and writing skills, which altered the course of the activity. Although this occurrence posed a challenge during the lesson, the pre-service teacher adjusted the lesson format to be more teacher directed as the students did not...
have the prior knowledge to engage in in-depth conversations. This reflection demonstrates the importance of being able to shift activities and pedagogical approaches so that student’s needs are met.

**Video Reflection:** Video recordings of the pre-service teacher implementing the lessons were reviewed as an additional form of data. The pre-service teacher watched the videos and reflected on her observations concerning her use of inquiry-based teaching methods. A coding system based off of the variations of the Five Essential Features of Inquiry Teaching and Learning Across All Grade Levels (NRC, 2000) was used to code the video reflection. Each code was derived from a variation of one of the essential features of inquiry [13]. Table 2 displays the five most observed variations of the essential features of inquiry.

Video reflection and analysis revealed that the pre-service teacher incorporated teaching strategies that enabled students to experience variations of all five essential features of inquiry within the teaching experience. NRC (2000) indicates that each essential feature of inquiry is accompanied by four variations that differ based on the amount of learner self-direction and teacher guidance incorporated into the lesson [12]. The results of the inquiry video analysis show that the pre-service teacher mostly incorporated variations that were either strictly teacher guided or strictly learner self-directed.

The teacher-guided aspects of the teaching experience included features of inquiry that were based on questioning and making connections. In terms of questioning, the pre-service teacher and the materials supplied by the pre-service teacher provided the questions in which the students were engaged. Students were provided with research questions for their activities and the pre-service teacher engaged students in discussions with guiding questions.

Making connections was also a teacher-guided feature of this teaching experience. Video analysis indicated that the learners were told most of the connections between the classroom activities and other scientific knowledge. After undergoing an experiment about acidic oceans, students were shown a video clip about how forms of pollution affect the ocean. This also acted as a visual aid for students; however, students themselves did not extrapolate the connections. In addition, the pre-service teacher facilitated various discussions and reminded students of important appropriate scientific vocabulary. Thus, the pre-service teacher gave the scientific connections to the students visually and orally, which in turn facilitated more class discussions about the topic. Overall, the teacher-guided aspects of this teaching experience indicate that the pre-service teacher was able to provide guidance throughout the lessons by facilitating discussions and providing experiences for students to visually see connections.

The remaining three essential features of inquiry in this lesson were learner-self directed. These essential features include giving priority to evidence when responding to questions, formulating explanations and communicating explanations. The video analysis showed that throughout the teaching experience students were making observations and recording what they determined was important evidence of the reactions taking place. As Table 2 shows, students decided that an important observation was that the piece of chalk was dissolving in the “very polluted” water. The pre-service teacher provided students with guiding questions and the students determined what the appropriate evidence was to answer the questions regarding the experiment.

Video analysis also indicated that students mostly formulated explanations on their own based on the evidence that they recorded. Because the pre-service teacher allowed the students to determine what constituted evidence, the students were able to understand and describe the reactions taking place in the experiments.

Finally, the video analysis indicated that communication was also learner self-directed. As students were able to collect evidence and formulate their own explanations, they were prepared to form logical arguments to communicate their explanations. Student contributions to class discussions were detailed, as summarized in Table 2. This evidence of learner self-directed communication is another indication of successful implementation of the essential features of inquiry in this teaching experience.

Over all, the learner self-directed features of inquiry in this lesson were successfully implemented in the sense that students were able use their science process skills and ultimately communicate their logically formulated explanations of the experiment to the class. In combination with the teacher-guided features of inquiry in this teaching experience, the essential features of inquiry were implemented in such a way that provided an engaging and interactive learning environment for the students.

<table>
<thead>
<tr>
<th>Table 1. Comparison of Statements Indicative of Commendations/Successes in Teaching and Implementation with Statements Indicative of Instructional/Pedagogical Challenges/Difficulties from the Before and After Teaching Reflections Regarding Inquiry Beliefs</th>
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</thead>
<tbody>
<tr>
<td><strong>Before Teaching</strong></td>
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<tr>
<td>Commendations/Successes in Teaching and Implementation</td>
</tr>
<tr>
<td>I took into consideration certain lessons that we had in class about shifting lessons to make them more inquiry-based and I suggested these changes to my team teachers. For the most part, my suggestions were accepted by my team teachers and this really benefitted the strength of our lessons.</td>
</tr>
<tr>
<td>Instructional/Pedagogical Challenges/Difficulties</td>
</tr>
<tr>
<td>The difficult part of planning our lessons is the being able to create and maintain an inquiry-based and age appropriate set up that the students would thrive in.</td>
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<tr>
<td><strong>After Teaching</strong></td>
</tr>
<tr>
<td>I learned that guidance and questioning is extremely helpful to communicating with students and monitoring their understanding. As I was teaching, each step of the way I was figuring out the best way to deliver the material, come up with individual questions and I had to think quickly. I specifically like that much of the teaching and facilitating strategies that I ended up using can be applied across the curriculum</td>
</tr>
<tr>
<td><strong>Instructional/Pedagogical Challenges/Difficulties</strong></td>
</tr>
<tr>
<td>We had a brainstorming activity that didn't work so well. Our goal was to complete a KW chart (Know-Want to Know Chart). Most of what the students talked about was what we had addressed previously in the first experiment. They did not bring up a lot of new information or ask question that could facilitate the discussion. The lesson turned more into a lecture than a class discussion and many students lost interest quickly.</td>
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**Pre-Service Teacher’s Science Teaching Self-Efficacy**

**Self Reflections:** Table 3 displays examples of journal reflections that are indicative of commendations/successes in teaching and implementation and statements indicative of instructional/pedagogical challenges/difficulties in regards to Self Efficacy. Before teaching, the pre-service teacher indicated having apprehension about self-efficacy. At the very beginning of the planning phase, she noted being intimidated by planning science lessons.
<table>
<thead>
<tr>
<th>Essential Feature</th>
<th>Most Frequently Used Variation</th>
<th>Variation Code</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learner engages in scientifically oriented question.</td>
<td>Learner engages in question provided by teacher or material</td>
<td>1.LEQP</td>
<td>When the pre-service teacher asks students, “What do you see?” the group of students talk amongst themselves and fill out their observation sheets. The pre-service teacher recites examples that were previously discussed in the sources of pollution lesson and asks students to elaborate on how those sources impact the ocean.</td>
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<tr>
<td>2. Learner gives priority to EVIDENCE in responding to questions.</td>
<td>Learner determines what constitutes evidence and collects it.</td>
<td>2.LDEC</td>
<td>As the pre-service teacher walks between groups, the students observe and point out and describe the reactions that they notice. Students write down their observations. One student claimed, “We noticed that when we put chalk in the ‘very polluted’ water…it dissolved quicker.”</td>
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<tr>
<td>3. Learner formulates EXPLANATION from evidence.</td>
<td>Learner formulates explanation after summarizing evidence.</td>
<td>3.LFEASE</td>
<td>The students who were engaged and used their process skills were able to make conclusions based on what they observed and know from previous lessons. Students take notice of reactions happening and describe what they see in their own words, making inferences about why the reaction is taking place and suggesting that the objects are breaking down because of the vinegar.</td>
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<tr>
<td>4. Learner connects explanations to scientific knowledge.</td>
<td>Learner told connections</td>
<td>4.LTC</td>
<td>The pre-service teacher facilitates students’ peer conversation by reminding them of key words (ex. pollution, dissolving)</td>
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<tr>
<td>5. Learner communicates and justifies explanations</td>
<td>Learner forms reasonable and logical argument to communicate explanation</td>
<td>5.LFRC</td>
<td>Students notice patterns and willingly talk to group members about what they are observing</td>
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</table>
A student makes a comment about how the shells in the experiment show that animals do not only get sick on the inside of their bodies, that their skin or exterior bodies can be damaged and/or broken down by pollution.

Table 3. Comparison of Statements Indicative of Commendations/Successes in Teaching and Implementation with Statements indicative of Instructional/Pedagogical Challenges/Difficulties from the Before and After Teaching Reflections Regarding Self-Efficacy

<table>
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<tr>
<th>Before Teaching</th>
<th>Instructional/Pedagogical Challenges/Difficulties</th>
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<tbody>
<tr>
<td>Commendation/Success in Teaching and Implementation</td>
<td></td>
</tr>
<tr>
<td>Seeing all of our efforts finally come together at the end of the planning stage certainly made me more confident and to teach these lessons.</td>
<td>My team members and I all seem to have some level of apprehension about our teaching abilities. At first thought, the idea of planning and implementing a three-hour long science institute is a little intimidating.</td>
</tr>
</tbody>
</table>

Once into the planning phase, she also indicated being uncertain of her abilities to implement her lessons effectively. This suggests that although the pre-service teacher indicates understanding of inquiry-based teaching, having little experience implementing inquiry-based teaching methods prior to this experience may be causing self-doubt and poor self-efficacy.

As the pre-service teacher saw her efforts materialize into concrete lesson plans and she became more confident about her teaching practices. This indicates that the final product was a reminder of the pre-service teacher’s understanding of inquiry-based science, suggesting that by realization of her own knowledge positively impacted her science teaching self-efficacy.

Analysis of the post-teaching reflection reveals that the majority of commendations of teaching/implementation pertain to ways that the pre-service teacher heightened her self-confidence in teaching science.

This includes receiving feedback from students and team teachers as well as gaining experience implementing inquiry-based teaching methods. This indicates that the pre-service teacher’s self-efficacy was positively affected by critical feedback and hands-on experience.

The only statement that reflected instructional difficulties referred to the pre-service teacher’s uncertainty of effective strategies to integrate writing and science without losing sight of the science content. This uncertainty led to a learning experience where she was left to alter her teaching methods to facilitate the students’ learning. The post-teaching reflection indicates suggestions such as “allowing students to draw pictures, or giving students key words to use helped to accommodate those students who had more difficulty writing.” This reflection suggests the importance of utilizing adaptive and accommodative strategies while teaching in order to reach out to all students. Although this occurrence was seen as a challenge for the pre-service teacher it ultimately benefited her self-efficacy as she realized the importance of and her ability to use adaptive teaching strategies. Overall, the pre-service teacher’s statements reflected growth in her self-efficacy beliefs throughout the entire planning and implementation phase of the teaching experience.

STEBI-B: The STEBI-I form allows the pre-service teacher to rate statements concerning self-efficacy as on a scale from “Strongly Agree” down to “Strongly Disagree”.

Before teaching, the pre-service teacher felt most confident in her belief that she would continually find new ways to teach science, and reach out to underachieving students. Item numbers 1, 4, 9 and 11 indicated these strong beliefs. Thus, she felt most confident in her self-improvement abilities, and showed confidence in finding new ways to help students learn. She felt least confident in her science content knowledge and abilities to deliver an effective lesson before teaching. Item numbers 3, 5 and 12 indicate this belief. These items also indicate uncertainty in effectively teaching science compared to other subjects.

After teaching, the pre-service teacher felt most confident with increasing her efforts to find new teaching procedures to help student achievement. Item numbers 2, 4, and 13 indicate these beliefs. Her most confident beliefs before and after teaching were similar, indicating a heightened level of self-confidence for finding effective teaching methods.

After teaching, the pre-service teacher indicated that she agrees that underachieving in science is due to poor teaching; however, she does not strongly agree with this statement. Similarly, she agreed that the low science achievement of some students could not generally be blamed on the teacher. These results indicate that she is not completely confident that she could help every student reach proficiency in science. The possibility of other factors interfering with a student’s learning is one possible reason for not responding to these questions with an absolute.

After implementation, the pre-service teacher’s belief that changed most significantly was item number 3, which indicates her heightened level of self-confidence in teaching science effectively in comparison to other subjects. The mostly positive changes revealed by the STEBI-B further justify her boosted confidence in her science teaching self-efficacy beliefs.
CONCLUSION

The findings revealed that (a) the pre-service teacher’s understanding of inquiry-based science teaching and learning were developed and enhanced through the planning phase and teaching phase of the field experience, which increased her abilities to implement inquiry-based activities and improve them as well and (b) the pre-service teacher’s science teaching self-efficacy beliefs improved resulting in a high level of self-confidence in teaching science as effectively as other subjects.

A convergent theme between the before teaching reflections and the prior to teaching STEBI-B survey indicates that the pre-service teacher was apprehensive about her abilities to implement an effective science lesson. The data retrieved prior to the teaching experience also indicates that the pre-service teacher was confident in her abilities to improve upon her teaching abilities by creating or shifting activities to be more inquiry-based.

A convergent theme between the after teaching reflections, the video reflections and the after teaching STEBI-B survey indicates that the pre-service teacher discovered that guiding and questioning directly impact learners’ cognitive inquiry and provides a means for monitoring both student progress and the effectiveness of the lesson. Data from these three sources also indicates that the pre-service teacher’s experience in developing her abilities to implement inquiry-based teaching methods increased her confidence in teaching science.

Comparing the data collected through self-reflections, video reflections and the STEBI-B survey prior to and after the teaching experience validates the pre-service teacher’s initial inclinations of being able to improve her teaching techniques and shift activities to become more inquiry-based. It also validates growth in her science teaching self-efficacy that resulted throughout the planning and implementation phases of this teaching experience.

The findings of this study confirm the literature that suggests action research as a method for teachers to improve their own science teaching (Akerson & McDuffie, 2002; Parsons & Reynolds, 1995; Kang, 2007) [1], [14], [8]. This study actualizes the theory that inquiry-based teaching has a positive effect on student learning (Akerson & McDuffie, 2002; Bleicher & Lindgren, 2005) [1], [2]. Prior to implementation, the pre-service teacher was confident in her ability to learn new teaching methods. However, after implementation, the results indicate that her confidence in learning new methods increased, as did her confidence in effectively using these methods in a classroom. Further, this study supports the literature, which suggests that those who have positive experiences will have a more positive self-efficacy (Bleicher & Lindgren, 2005) [2].

In summary, this study has shown that as one develops his or her understanding of inquiry-based science, his or her confidence in planning and teaching inquiry-based science lessons also increases; thus, positive science teaching self-efficacy results. The findings suggest that inquiry-based teaching early on in teacher education programs and allowing pre-service teachers to practice the methods taught in class before they become teachers both help to develop a strong self-efficacy.

SCHOLARLY SIGNIFICANCE

As inquiry-based science education is becoming increasingly recognized as essential for scientific literacy, it is important for more teachers to be comfortable with this approach. To accomplish this, many teacher education programs stress the importance of inquiry-based science, but few provide opportunities that allow pre-service teachers to engage in inquiry-based practices that are necessary for them to understand its importance at a deep and personal level. The findings from this action research study suggest that providing this opportunity can contribute to both deep understanding of inquiry-based science instruction as well as increased self-efficacy for such teaching.

These findings also suggest an effective method for teacher preparation programs to embrace. More individual pre-service teacher action research studies can provide more perspectives and suggestions for effective teaching strategies. This form of pre-service teacher action research is a form of inquiry in itself and is transferable to virtually any discipline in a teacher education program.

REFERENCES