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INCREASING SELF-EFFICACY AND QUALITY LESSON PLANNING USING LESSON-
STUDY WITH ELEMENTARY PRESERVICE TEACHERS

A Dissertation
presented in partial fulfillment of requirements
for the degree of Doctor of Education
in the School of Education
The University of Mississippi

by

ELIZABETH ANN MITCHELL

May 2014

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ABSTRACT

This qualitative, quasi-experimental study examined if lesson-study could be a successful approach in improving lesson plan quality and increasing self-efficacy levels toward teaching science at the preservice elementary teacher level in North Mississippi. Lesson-Study can be defined as a cycle of instructional improvement in which small groups work together to design and teach a lesson, revising again as needed over the course of a semester. This study described the experiences of two sections of preservice teachers enrolled in a science methods course as they engaged in lesson-study at a comprehensive university in Northeast Mississippi. One section of the class served as the control group while the other section, as the treatment group, received lesson-study over the course of the semester. Data was gathered in the form of interviews, observations, and a self-efficacy survey (STEBI-B). Lesson plans were also graded using a rubric to determine quality level.

Findings indicated that, while not statistically significant, the treatment groups scores on the self-efficacy instrument increased more on average than the control groups' scores. There were also positive comments about the lesson study process from the teacher candidates in the treatment group as well as positive behaviors recorded by the researcher. Additionally, according to the external evaluators who graded the final drafts of the lessons, the treatment group had

greater gains than the control class on average. These conclusions suggested the lesson study process implemented during the preservice teaching level can be beneficial.

DEDICATION

This work is dedicated to my parents, Mike and Teresa, who have always supported me in all that I have ever done. They instilled in me that with hard work, I can do anything I put my mind to. To my parents, I can never thank you enough for all that you have done for me. I love you!

This work is also dedicated to my sister Laura, and my grandmother Linda. They have heard progress of the dissertation process the whole way. To them, I say thank you for your encouragement and support.

This work is also dedicated to my grandparents who have passed away, Gaston, Betty, and Joel. Without their love and support through my life, I would not be where I am today.

This work is finally dedicated to my boyfriend, Dudley. He has also encouraged and tirelessly listened to details about my degree program. He has edited and given wonderful advice throughout my dissertation process. To Dudley, I am grateful for all your help, encouragement, and especially love!

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CHAPTER I: INTRODUCTION

Research Problem

According to the results of the 2011 Third International Mathematics and Science Study (TIMSS), Japanese students are performing better than United States' students in science (Provasnik, Kasttberg, Ferraro, Lamanski, Roey, & Jenkins, 2012) possibly because of professional development methods. For educational improvement in science to occur in the U.S., the culture of teaching must be changed (Stigler, Hiebert, 1999). The current norm of individualistic work needs to be expanded to teamwork—teaching needs to include effective collaboration involving respectful discourse. Japan has had significant, long-term success with lesson-study as a professional development approach. Lesson-Study has been used in the U.S. since the release of the *Teaching Gap* in 1999 (Stigler, Hiebert, 1999). Stigler and Hiebert (1999) highlight how the Japanese successfully implemented “lesson-study” with their teachers. By implementing lesson-study with preservice teachers at the undergraduate college level, U.S. schools could possibly close the learning gap with other nations.

Lesson-study is a form of professional development that exists as a cycle (Lewis, 2002). To begin lesson-study, teachers work in groups of four-six to design one research lesson (Lewis, 2002). The time spent on the lesson-study process is usually a semester or a yearlong (Lewis,

2002). The teachers begin the lesson-study by determining target goals, writing lesson plans, and presenting the lesson to his/her classroom students while other team members observe the lesson by each member focusing on a certain aspect previously determined by the team (Lewis, 2002). It is important to note that observing team members are focusing on student learning rather than critiquing a teacher presentation (Perry & Lewis, 2008). Immediately following the lesson, team members will reflect on the effectiveness of the lesson and compare observational notes about student learning (Lewis, 2002).

During the reflective period, the teachers will revise parts of the lesson as needed and choose another team member to teach the same lesson in his/her classroom (Lewis, 2002). The other team members will follow the same sequence—observe, reflect, and revise (Lewis, 2002). The process will continue until team members feel confident with the progress of the lesson (Lewis, 2002). Throughout lesson-study, the team members often ask experts in the field to provide additional research and advice about the content of the lesson (Lewis, 2002). When the lesson is complete, the team members often invite the entire faculty at the school site to observe the final lesson presentation (Lewis, 2002). Often times a subsequent reflective session will follow, again with all faculty at the school site. Afterwards, the lesson is filed at the school site for future teachers to use (Lewis, 2002; Perry & Lewis, 2008).

Three Aspects of Lesson-Study

Lesson-study has been used in Japan for approximately a century, whereas in U.S. school systems, it is relatively new. Three aspects of lesson-study are vital to its success: collaboration,

research, and observation skills. These three aspects will be discussed in the following paragraphs.

Collaboration is at the heart of lesson-study and often times teaching in the U.S. can be a very isolated experience (Stigler & Hiebert, 1999). Today, many teachers plan individually and seldom collaborate with colleagues regarding lesson planning and student learning (Lewis, 2002). Teachers rarely have the opportunity to observe other teachers in their school (Lewis, 2002). Therefore, lesson-study allows teachers to make connections between their work and their colleagues' work (Lewis, 2002).

Many teachers in the U.S. are not accustomed to the rigorous level of research that lesson-study demands. During the planning phase of lesson-study, teachers decide what they want to test through lesson-study (Stigler & Hiebert, 1999). This decision is based around student learning and how the final lesson impacts student learning (Stigler & Hiebert, 1999).

Members of a lesson-study team must have excellent observation skills which are used during the implementation of the lesson by the members of the group not teaching. The goal is to not critique the presenter of the lesson, but instead focus on student learning. It is important to observe what causes student misconceptions as well as what instructional activities enhance learning. Members observing the lesson must also record student responses, to keep on file for future teachers who plan to implement the lesson (Stigler & Hiebert, 1999).

Studies Addressing the Problem

Lewis, Perry & Friedkin (2011), examined two U.S. lesson-study groups using a Japanese teachers' manual to design a lesson. The researchers coded a U.S. teachers' manual and

compared it to a coded Japanese teachers' manual. The manuals were coded on six features. One of these features was how much time was dedicated to a topic. The other features were taken from Ball and Cohen's (1996) propositions. Two features found more often in the Japanese manuals were the amount of anticipated student thinking and justification for pedagogical methods.

Through the U.S. lesson-study, researchers observed teachers successfully using the Japanese manual as it gave the U.S. teachers deeper insight into student learning through the numerous examples of student responses provided in the text. According to Lewis, Perry and Friedkin (2011), the U.S. teachers also had personal learning moments through the lesson-study process by using the Japanese manual. One concern noted through the study was that teachers did not follow the allocated time suggestion in the Japanese manual. The U.S. teachers decided instead to combine two days worth of the Japanese manual into one lesson. The researchers noted that this could be because the teachers were trying to keep the pace similar to their comfort zone (Lewis, Perry & Friedkin, 2011).

Parks (2009) looked at collaboration during lesson-study at the preservice teacher level in the U.S. -- the researcher found that in some cases, collaboration, which is at the heart of lesson-study, could actually serve to hinder participant learning. As groups of preservice teachers worked together to develop a lesson through lesson-study, the researcher chose to follow a group in which the initial assumption was that the group would be successful with lesson-study. The reason the researcher had initially deemed this group "*successful*" was because the group seemed to be working together well. The students seemed passionate and contributed equal efforts of

work toward the lesson. As the study continued, the researcher realized that even though the participants of this “*successful*” group had different backgrounds, they had similar novice teaching beliefs. Through the group’s discussions, it was evident to the researcher that the participants were quick to agree with one another, which sometimes supported novice teaching habits (Parks, 2009). This could be a result of peer-group agreement because no one wanted to disagree with the group. Park’s (2009) study gives an example of how lesson-study at the preservice level can possibly be unsuccessful for professional growth as a result of collaboration that supports teaching beliefs common to novices (Parks, 2009).

Perry and Lewis (2008) found their lesson-study could be successful in the U.S., because at the time, the site had been engaged in lesson-study for over four years. One important shift that the authors noted is that participants’ thinking changed from viewing lesson-study as a tool to produce a lesson, to viewing lesson-study as a tool to improve instruction over time (Perry & Lewis, 2008). Researchers have concluded through studies that the U.S. can adapt to the lesson-study approach with persistence (Hart, 2008-2009; Perry& Lewis, 2008).

Deficiencies in the studies

Despite the success lesson-study has seen in the U.S., it is still not widespread and is relatively viewed as a new approach to professional development. While many studies examining this problem have been conducted, more research is needed to determine if lesson-study could successfully be implemented in the U.S. on a wide scale. Specifically, more research is needed to determine if lesson-study could help improve self-efficacy of teaching science at the preservice level.

Lewis, Perry and Friedkin (2011) found success with lesson study in that participants were able to gain a deeper understanding of student learning. Perry and Lewis (2008) also found success with lesson study because participants began viewing lesson study as a form of ongoing professional development. However, neither study looked at preservice teachers with lesson study. In the Lewis, Perry & Friedkin (2011) study, pace was a concern to the researchers since participants covered more materials in less time than the Japanese manual suggested -- a reflection of a cultural difference in teaching. The U.S. can begin to change this cultural difference by using lesson-study at the preservice teaching level (Stigler & Hiebert, 1999).

Parks (2009) did not point out in her study that collaboration could sometimes be ineffective at the preservice level during lesson-study because it is not a cultural norm of teaching in the U.S. Specifically, Japan's teachers know how to effectively collaborate because of the many years of practice. Stigler and Hiebert (1999), discussed how teaching could be a cultural activity which follows a cultural script... "generalized knowledge about an event that resides in the heads of participants (Stigler & Hiebert, 1999, p.85)". Preservice teachers have this script embedded in them which likely does not involve much collaboration in teaching (Stigler & Hiebert, 1999). While effective collaboration may not be the norm in the U.S., this study examined if preservice teachers could be successful collaborators who challenged one another's ideas unlike in Parks' (2009) study where they generally agreed with one another.

In addition to examining these three themes (collaboration, research, and observation), another aspect of this study looked at lesson-study conducted at the preservice level with a focus on science education. The U.S. falls behind countries such as Japan in this content and it is vital

to the success of the U.S. that students stay competitive with other countries. Many elementary teachers do not teach science because of a lack of content knowledge (Duran, Ballone-Duran, Haney, & Beltyukova, 2009). This study offers a unique aspect by looking at how lesson-study affects self efficacy toward science teaching at the preservice level while also qualitatively examining the adaptation of collaboration, research skills, and observation skills needed for lesson-study.

Significance of Study for Audiences

A study examining the use of lesson-study at the preservice level is significant for many reasons; the culture of education in the U.S. can be changed from isolated teacher experiences to collaborative teaching communities. This study examined the lesson-study approach at the preservice teacher level; specifically, the study examined the possibility that it (i.e., lesson study) may serve as a model for universities as well as school districts. Furthermore, it investigated the promise of incorporating lesson-study at all levels of a teacher education program that might provide preservice teachers with a richer experience than university supervisors' guidance alone. School district administrators could include professional developments in lesson-study as an effective teaching strategy. Unlike coaching, the ongoing nature of lesson-study creates professional networks amongst the faculty of a school (Lewis, Perry, Foster, Hurd, & Fisher, 2011).

Limitations

Certain limitations existed in this study. One limitation was that groups could not be randomly assigned, but participants were teacher candidates enrolled in a science methods course

at a comprehensive university. The results from the study could be reflective solely on the participants included in the study. However, this study adds to the existing quantitative and qualitative literature about lesson-study in the United States.

Purpose Statement

The purpose of this qualitative, quasi-experimental study was to examine if lesson-study is a successful approach in regards to improving lesson plan quality according to a rubric, and increasing self-efficacy, an individual's belief in own ability to perform an action (Bandura, 1997), toward teaching science at the preservice elementary teacher level in North Mississippi. This study describes the experiences of preservice teachers engaging in lesson-study at a comprehensive university in Northeast Mississippi. Lesson-Study can be defined as a cycle of instructional improvement in which small groups work together to design and teach a lesson, revising again as needed over the course of a semester. The study was limited to participants enrolled in two summer sections of an elementary science methods course which occurs prior to the student teaching semester in the Teacher Education Program. One section of the class served as the control group and the other section, as the treatment group who received lesson-study over the course of the semester. The researcher conducted interviews, made observations, and asked students to complete a self-efficacy survey with each section of the class. Lesson plans also were graded using a rubric to determine quality level.

Hypothesis

The instrument used to assess self-efficacy was the STEBI-B, which is discussed in Chapter three. The null hypothesis for this study was that the treatment groups' STEBI-B scores

would not significantly increase more than the control groups' class scores at the .05 alpha level between the pretest and posttest administration. The alternate hypothesis for this study was that the treatment groups' STEBI-B scores would significantly increase more than the control groups' class scores at the .05 alpha level between the pretest and posttest administration.

Research Questions

- 1. Does lesson-study at the preservice level improve self-efficacy toward science teaching?*
- 2. Does lesson-study improve the quality of lessons based on the "Mini Lesson Rubric" (see table A4)?*
- 3. What aspects of lesson-study are performed well by preservice teachers?*
- 4. With what aspects of lesson-study do preservice teachers struggle?*
- 5. Does lesson-study distract preservice teachers from the goal of completing assignments or does it improve quality of assignments based on the "Mini Lesson Rubric" (see table A4)?*

List of Terms

Lesson study- Lesson-study is a cycle that involves teachers working collaboratively in teams of 4-6 members (Lewis, 2002).

Self-Efficacy- Bandura (1997) defines self-efficacy as "the beliefs in one's capability to organize and execute the courses of action required to produce given attainments (Bandura 1997, p.3)".

CHAPTER II: REVIEW OF THE LITERATURE

What is Lesson-Study?

Lesson-study is a professional development approach, which is popular in Japan and has been used in several U.S.' sites since 1999 with the release of *The Teaching Gap* (Stigler & Hiebert, 1999). Lesson-study is a cycle that involves teachers working collaboratively in teams of 4-6 members (Lewis, 2002). Lewis (2002) described how a typical lesson would flow. Before lesson-study began, all the participating lesson-study groups of the school met together and determined a research theme for the lesson-study groups (Lewis, 2002). Once the theme was determined, the lesson-study groups broke off and designed a lesson (Lewis, 2002).

After the lesson was written, one team member would present the lesson to a class while other members observed the lesson and student learning (Lewis, 2002). Student learning was the focus of the members not teaching the lesson (Lewis, 2002). During the lesson, observing team members collected information on student learning such as “what the students said and wrote, how the students used the materials, what specific strategies supported or encouraged understanding, and what obstacles to learning arose during the lesson” (Lewis, Perry, Hurd, 2004, p. 20). The student responses were recorded and filed along with the final draft of the lesson to be used as a resource for future teachers to use.

Following the lesson, the team members reflected, critiqued, and debriefed on the lesson and student learning (Lewis, 2002). In subsequent meetings, the members reflected upon the lesson-study and revised the lesson. After all the revisions were made, another group member taught the lesson to his/her class while others observed student learning (Lewis, 2002). Often, the entire faculty was invited to observe the lesson (Lewis, 2002). Following the presentation of the lesson, a debriefing session followed again, including the lesson-study group as well as the entire faculty. The focus of the debriefing was again on evidence of student learning observed through the lesson. The group members reflected and revised again if needed (Lewis, 2002). This process could continue for a semester or even a year if desired on the one lesson (Lewis, 2002). During the process of lesson-study, teachers draw on outside sources of information such as content specialists, university educators and also research articles (Lewis, Perry, Hurd, O'Connell, 2006).

Lesson-Study Misconceptions

One misconception towards lesson-study is that the process of lesson-study has the primary goal of creating one 'perfect' lesson (Lewis, 2002). This was the initial belief at Highlands Elementary School in San Mateo, California, where teachers began implementing lesson-study. Soon after the teachers engaged in the lesson-study, they described how the process allowed them to "be researchers" as well as "understand the content and why it's important" (Lewis, Perry, Hurd, O'Connell, 2006). Lesson-study encompasses much more than the product of a single lesson. It also involves the process of creating the lesson as teachers grow professionally (Hunter & Back, 2011). The experience of lesson-study allows teachers to

collaborate, observe, engage in discussion, and work toward the common goal of enhancing student learning (Hart, 2008-2009). Lesson-study is not meant to make drastic changes quickly; rather it is a process that can produce gradual and steady improvements in teaching (Stigler & Hiebert, 1999).

Another misconception of lesson-study is that members of a lesson-study group create lessons from scratch (Lewis, 2002). Lesson-study groups seek out the best approaches and lessons on which to adapt and improve upon (Lewis, 2002).

Benefits of Lesson-Study

Stigler and Heibert (1999) reported that the most targeted focus of lesson-study is on student learning. In the U.S., teacher success has often been based on whether the teacher implemented desirable teaching practices instead of the teacher's students achieved mastery. The focus on student learning with lesson-study differs from past professional development opportunities implemented with U.S. teachers (Stigler & Hiebert, 1999).

Lesson-study also has the advantage of taking place on site, in the classroom environment, as opposed to a setting in which educational researchers are translating their findings to teachers in a professional development program. Through the process of lesson-study, teachers assume the role of researchers and the findings they discover can be instantly used to improve teaching. This idea of teachers as researchers also allows teachers to see themselves as professionals and contributing members of their profession (Stigler & Hiebert, 1999). In the U.S., teachers do not have the opportunity to contribute their findings to their peers in large settings in the same context as Japanese teachers (Stigler & Hiebert, 1999). Teacher

professional development in the U.S. often consists of educational researchers passing on their research findings to teachers for them to use in the classroom (Stigler & Hiebert, 1999).

Sometimes the form of this information is an activity or a unit. While this may be useful information, when teachers participate as researchers and are allowed to share findings in a professional development situation, the information could be more relevant to fellow teachers as well as administrators, and researchers (Stigler & Hiebert, 1999).

One of the problems with the typical professional developments often seen in the U.S. is that educational researchers often do not know or have forgotten what really happens in the classroom. This is why the information that is presented to teachers at professional developments is often irrelevant or not useful. In Japan, professional development revolves around the “research lessons” created within the schools lesson-study groups. The teachers examine the different lessons that were produced and take back what they learn and can apply it to their own classrooms. There are many other benefits of lesson-study. Lewis (2002) stated that lesson-study:

- “brings educational goals and standards to life in the classroom;
- promotes data-based improvement;
- targets many student qualities that influence learning;
- creates grassroots demand for instructional improvement; and
- values teachers.”

The first of these benefits that Lewis (2002) discussed is that lesson-study brings to life educational standards and goals for students in the classroom. Through the collaborative process

of lesson-study, Japanese teachers make sense of the standards and convey it to the students in a meaningful way (Lewis, 2002). Japanese teachers are responsible for fewer standards than U.S. teachers which allows them to deeply understand each standard and convey it to their students in a meaningful way. Since, Japan has fewer standards than the U.S., more time is allowed for the students to make connections within the content and for the students to deeply understand each topic.

Lesson-study “promotes data-based improvement” (Lewis, 2002, p.8). In the U.S., teachers and educational reformers rely heavily on standardized testing to supply data on student learning. In Japan, data collected through lesson-study is emphasized. In lesson-study, teachers are able to determine areas for improvement and in observing student learning, teachers are enabled to determine how to make these improvements (Lewis, 2002).

According to Lewis (2002), lesson-study “targets many student qualities that influence learning” (Lewis, 2002, p.10). Lesson-study has the advantage of creating a coherent learning environment where the same values are upheld throughout the school. This contributes greatly to student learning (Lewis, 2002). This coherent environment is formed also by the collaborative nature of lesson-study (Stigler & Hiebert, 1999). By teachers working together to plan lessons, they know more about the students they teach because they can see how a student behaves in another classroom. Also, when teachers observe their fellow teachers, they can observe methods and techniques that other teachers use to promote student learning and then easily apply it within their own classroom (Stigler & Hiebert, 1999).

Lesson-study “creates demand for improvement” (Lewis, 2002, p. 11). It is not required for Japanese teachers to incorporate research lessons observed into their own classrooms; however, in Japan, new approaches that inspire student learning are spread rapidly. By observing research lessons developed by lesson-study groups, teachers are motivated to improve their own teaching (Lewis, 2002). Stigler and Hiebert (1999) discussed how lesson-study promotes benchmarks. Lesson-study allows teachers to evaluate their own skills compared to other teachers and see areas where improvement needs to occur (Stigler & Hiebert, 1999).

Another benefit Lewis (2002) noted is that lesson-study puts value back on teachers. Through the research aspect of the lesson as well as the collaboration with colleagues, professionalism is brought to the career of teaching (Lewis, 2002). Lesson-study may also improve teaching practices. Through the process of lesson-study, teachers are able to pick up new teaching techniques from their colleagues, which in turn, are used in their own classroom (Lewis & Tsuchida, 1998).

In Japan, lesson-study is believed to have potential for change in educational policy (Alvine, Judson, Schein, & Yoshida, 2007). In Highland Elementary School, the teachers demonstrated how coherence across instruction can occur through lesson-study. Also a “school-wide culture of learning from practice” can be gained through the process (Lewis, Perry, Hurd, O’Connell, 2006).

Lesson-Study does take time out of teachers’ busy days; however at one US site, the administrators found ways to cut down on faculty meetings in order to allow time for lesson-study. Also, lesson-study can replace mentoring duties, considering new teachers are being

mentored through lesson-study by more advanced teachers (Lewis, Perry, Hurd & O’Connell, 2006). Discussion between experienced and novice teachers about lessons can help novice teachers be aware of possible common responses and misconceptions that students may have during the lesson (Alvine, Judson, Schein, & Yoshida, 2007).

The Need for Lesson-Study in Science Classrooms

According to the most recent, 2011 *Third International Mathematics & Science Study* (TIMSS), the U.S. is ranked in the top 10 in international science education systems for science in grade four. In grade eight, the U.S. is ranked within the top 23 science education systems (Provasnik, Kasttberg, Ferraro, Lamanski, Roey, & Jenkins, 2012). Japanese children scored higher on average in both 4th and 8th grade science than children in the U.S. (Provasnik, Kastberg, Ferraro, Lemanski, Roey & Jenkins, 2012). According to the *New K-12 Science Education Standards* (National Research Council, 2012), the U.S. is lacking workers with strong backgrounds in the fields of science, engineering, and technology. Actions within the United States have been taken to help improve science education. The Next Generation Science Standards were developed to help students be “college and career ready” in regards to science (NGSS Lead States, 2013). Improvements in K-12 science education can possibly help in producing graduates who can be competitive in the U.S. workforce. *The New K-12 Science Education Standards* (NRC, 2012) also point out that science and engineering practices need to be emphasized not only for the student who will pursue a career in science or engineering, but also for every citizen. Everyday decisions in the world revolve around science, technology and engineering. For students to become scientifically literate and successful, these issues need to be

addressed in the classroom in a way that will promote student learning (NRC, 2012). An example of an everyday decision might be how we can influence our environment with pollution.

Lesson-study is one way that teachers can help to prepare their students for the increasingly technological world. With lesson-study, teachers can collaborate and discuss how they can incorporate ways to include technology and demonstrate the science and engineering behind modern technology.

Adaptations of Lesson-Study in the US

There are many aspects to consider before implementing lesson-study in the U.S. Stigler and Hiebert (1999) discussed how before 1999, despite the great success that Japan has had with lesson-study, the U.S. paid little attention to the strategies. One reason the U.S. has been slow to take interest in lesson-study is because while improvements are steady, they are gradual and do not occur overnight and the United States in the past has expected rapid improvements (Stigler & Hiebert, 1999).

Teachers in Japan are accustomed to the level of collaboration involved in lesson-study because working as a unit is a cultural norm. In the U.S., teachers are many times very isolated in their practice (Stigler & Hiebert, 1999). Also, teachers in the U.S. are usually not observed by several faculty members at one time, much less, the whole faculty of a school (Stigler & Hiebert, 1999). Being observed is a major component of lesson-study (Lewis & Tsuchida, 1998). Also, teachers must have the observation skills when looking at student learning (Stigler & Hiebert, 1999). They must know what student learning looks like and also be good observers of student responses. Lewis and Tsuchida (1998) describe four conditions seen in Japan and could be

reasons behind the success of lesson-study in Japan. The four conditions are: “a shared, frugal curriculum; collaboration among teachers; and self-critical reflection and stability of educational policy” (Lewis & Tsuchida, 1998, p. 50-51).

Lewis (2002) described how a shared curriculum and common standards would aid in supporting lesson-study (Lewis, 2002). Japan is an example of a country who has a very frugal curriculum. Within elementary curricula in Japan, several broad goals for every subject area are presented with only a small amount of topics within those areas (Lewis, 2002). Lewis (2002) gives the example of how fifth-graders in Japan cover only seven topics in 95 science periods. This allows Japanese teachers the time to make deep impressions of the content on the students. In the past and still today, American teachers are sometimes expected to finish covering a single science topic in one period. This robs the teachers of time to study student learning toward the topic. In the present, the U.S. is moving toward that goal of a shared curriculum with the Common Core State Standards for Mathematics, Language Arts and Social Studies as well as the Next Generation Science Standards. The U.S. is at an excellent point to implement a professional development strategy such as lesson-study.

Collaboration among teachers is required for lesson-study to succeed. In Japan, collaboration is encouraged not only at the teacher level but is also encouraged amongst the students. Lewis and Tsuchida (1998) discuss how even if lesson-study did not exist in Japan, teachers would still collaborate on a routine basis. The substitute teachers are brought in often to cover classes for teachers while collaboration on lessons occurs (Lewis & Tsuchida, 1998). There is a misconception that Japanese teachers spend less time with students on a daily basis,

allowing more time for lesson-study (Lewis & Tsuchida, 1998). In fact, Japanese teachers spend the same amount of time with students if not more than U.S. teachers (Lewis & Tsuchida, 1998).

Self-critical reflection, *hansei*, is a huge part of the Japanese classroom, both with the teachers and with the students. With self-critical reflection being highly emphasized, less emphasis is placed on teacher evaluations which creates a safe environment for teachers to be open about their weaknesses. Since collaboration in lesson planning is a major component of lesson-study, constructive criticism is shared amongst the group instead of placed on the individual. (Lewis, Tsuchida, 1998)

Stability of educational policy is another supporting condition of lesson-study identified by Lewis and Tsuchida (1998). Japan rarely implements new policy change, making it easier for teachers to focus on implementing the changes fully when policy does change. This is unlike the U.S. in that educational reforms happen much more frequently, keeping teachers on edge and always ready for a new change (Lewis & Tsuchida, 1998).

Fernandes, Cannon and Chokshi (2003) examined lesson-study in an urban school located in New Jersey. In this study, twelve Japanese teachers were recruited to coach the American teachers of the school on how to use lesson-study. The Japanese teachers taught the American teachers the fundamentals of lesson-study and then guided the teachers through the actual process of lesson-study. Researchers in this qualitative study found that application of three critical lenses (i.e., researcher lens, student lens, and curriculum developer lens) needed to occur for the American teachers. Specifically, the American teachers had great difficulty in adopting the researcher lens. The Japanese coaches tried to assist the American teachers

throughout the process to see themselves as researchers and the lesson as an experiment. In the lesson-study process, the American teachers had different ideas about the best way to present the lesson. The Japanese reminded the teachers that through lesson-study, teachers are able to test their ideas about the best way to present a specific lesson. While the American teachers took this advice and compared the teaching in the different classrooms, they still did not truly take on the researcher lens because they did not look at why one teaching style worked better than another by examining the different variables. Even though the American teachers had difficulty in adopting the desired lenses, the researchers of this study still felt like lesson-study is something that should be embraced by the U.S. The researchers suggested that if lesson-study is implemented in different schools in the U.S., the teachers need support and guidance when learning the lesson-study process as well as support in developing critical lenses (Fernandes, Cannon & Chokshi, 2003).

Hart (2008-2009) builds upon the work of Fernandes, Cannon and Chokshi (2003) by trying to encourage development of the identified critical lenses in their work (research lens, student lens, curriculum developer lens). Participants of the study were eight third-grade teachers at an urban school district in the U.S. Beginning the lesson-study process, many adaptations were made and compared to lesson-study that happens with teachers in Japan. One adaptation was that the U.S. teachers were instructed on what lesson-study was, before the process began. The researchers were also more involved than would have been in a true Japanese lesson-study. The U.S. teachers needed to be prompted to engage in rich discussions and needed guidance in order to get the most out of the lesson-study process. In Japan, lesson-

study is a norm whereas in the U.S., teachers must be molded to engage correctly in the lesson-study process. The research of Fernandes, Cannon and Chokshi (2003) reports that U.S. classrooms will need to have such adaptations for lesson-study to be successful.

Hart (2008-2009) found through the study that teachers did grow in the student and curriculum developer lenses but not in the researcher lens. This suggested that lesson-study can be implemented successfully in the U.S. with proper adaptations. Hart's study also suggests that coaches who are knowledgeable in the process of lesson-study are needed to push the goals of lesson-study which are to create "a culture of self-criticism, openness to the ideas others, and willingness to embrace mistakes" (p.41). While there were positive outcomes from the study, the study also revealed that much research is needed to find out how to successfully promote development of all three critical lenses with U.S. teachers (Hart, 2008-2009).

Lesson-study in Colleges

One way to promote development of the three critical lenses of lesson study (research lens, student lens, curriculum developer lens) outlined by Fernandes, Cannon and Chokshi (2003), is to start training teachers on the lesson study process during college. Lesson-Study has been used in colleges across the U.S. At Harvard University in a calculus course, graduate students along with an experienced faculty engaged in lesson-study and found it to be a useful professional development tool. Before introducing lesson-study to the program, teaching fellows would go through training and then be placed in the classroom with an undergraduate assistant. Once the fellow was in the teaching line-up, the program had no type of training follow-up available for the fellow to continue in teaching development. By adding the lesson-study to their

program, the researchers found that it had a positive effect on their program. Lesson-study improved the teaching skills as well as the overall content being taught (Alvine, Judson, Schein, & Yoshida, 2007).

Dotger (2011) conducted a similar study at a northeastern U.S. research university. The participants included four graduate teaching assistants. Through this study, the graduate teaching assistants used lesson-study while the researcher conducted interviews with the participants, collected field notes, and other forms of data. Four themes were derived from the researcher's data.

The first theme that was pulled out of the research was "...the revised groundwater lab was influenced by the structure and content of the original lab, as well as the goals discussed during planning seminars (Dotger, 2011, p.161)". The students did make changes that reflected the goals developed during the planning phase of lesson-study, however, these changes were minimal. The researcher contributed this to situated cognition which relates to the graduate teaching assistants relationship with teaching. Even though the graduate teaching assistants realized how they could more drastically improve the lesson, they did not deviate far from the original lesson plan. This could be because of the traditional practices which many faculty members of the department did not support the change.

The second theme that the researcher pulled from the data was "...GTAs talk about teaching largely focused on course logistics and problems with students, with limited input from faculty" (Dotger, 2011, p. 162). The researcher noted that at the beginning of the lesson-study process, the graduate teaching assistants rarely if ever talked about the teaching aspect of the labs

while primarily discussing logistics and student problems. However, through the lesson-study process, the content of the graduate teaching assistants' discussions began to shift focus more on the teaching aspect of their jobs.

In the third theme, "...GTAs differ in their interpretations of the reasons students have difficulty with the content" (Dotger, 2011, p. 162). The researcher notes that the graduate teaching assistants were at a disequilibrium. Two of the graduate teaching assistants started thinking of possible wording that was included in the lesson that might be causing confusion and how they could clear up any misunderstandings. The other two graduate teaching assistants blamed the students for not understanding or for demonstrating poor work ethic. While not all of the graduate teaching assistants focused on the instruction being the culprit for student misunderstanding, two of the graduate teaching assistants were changing their thinking by examining how instruction effects student learning.

In the fourth theme "...gathering observational evidence during the research lesson was challenging for the GTAs" (p. 164), Dotger (2011) discusses how the GTAs' limited pedagogical knowledge made observing student learning difficult. The notes that the graduate teaching assistants took when observing a fellow graduate teaching assistant focused primarily on the instructor and the presentation. They were not observing student learning.

The researcher discusses that while major changes did not occur, smaller changes did happen. Dotger (2011) presents these small changes as examples of what Hiebert and Stigler (2004) believe can change the culture of teaching.

Why Lesson-Study with Preservice Teachers?

Stigler and Hiebert (1999) suggest that one leverage point for creating a culture of lesson-study would be to implement the lesson-study at the preservice teacher level. Currently in the U.S., many preservice teachers have never heard of lesson-study. By incorporating lesson-study in a preservice teacher education program, teacher candidates would receive experience in planning lessons in a team collaboratively (Stigler & Hiebert, 1999). Teacher candidates would also be exposed to different student responses in a lesson and be more experienced in anticipating future student responses (Stigler & Hiebert, 1999). If lesson-study is a direction that the U.S. decides to take, then preservice education programs need to be tweaked to include the values of lesson-study.

Santagata and Guarino (2012) found in their study with preservice teachers that the teachers' initial grasp of the concept of collaboration was not at the level required for settings such as lesson-study. Santagata and Guarino also found that with guidance, preservice teachers can learn collaboration skills. Also, while preservice teachers are participating in fieldwork, collaboration can be built upon.

Teachers in the U.S. often experience isolation in their profession. Many times teachers believe that they are teaching the same thing or the same way as other teachers at their school when in reality, the teachers are on completely different levels (Stigler & Hiebert, 1999). Preservice teachers experience much of the same problems in-service teachers do with isolated experiences. Most universities require teacher education students to complete field experiences throughout their program. While field experiences create unique hands-on learning experiences

for teacher candidates, the experience can feel isolating. Most universities have supervisors from the college observe student teachers during field experience. While the preservice teacher is provided valuable feedback from the supervisor, the amount of visits the supervisor makes is often limited as a result of travel expenditures and time. By providing preservice teachers with an opportunity such as lesson-study, they are enabled to collaborate with peers that are at the same level throughout their field experiences and in turn, the preservice teacher can grow more professionally. “Findings indicate that peer feedback as a pedagogical approach enhances initial teacher preparation and encourages attributes of in-service professional practice, such as improved reflection on teaching practice, greater professional confidence, and more focus on student learning” (Wilkins, Shin, & Ainsworth, 2009, p. 90). Lesson-study is a way that preservice teachers can receive encouragement through struggles and also learn from their peers. “Peer feedback practice is a pedagogical approach that promotes reflection and collaboration” (Wilkins, et al., 2009, p. 89). Many teacher education programs highlight the importance of reflection when teaching. Through lesson-study, preservice teachers can practice the skill of reflection collaboratively instead of individually. “Reflection and collaboration are two assets for teacher candidates in terms of growing developmentally as educators and experiencing, first-hand qualities of professional, life-long learning” (Wilkins, et al. 2009, p. 90). From the Trautwein and Ammerman (2010) article, “... if, however, a preservice teacher habitually reflects on every teaching experience from early one-on-one field experiences to late field experiences where he or she is charged with educating a classroom of students, that teacher is more likely to engage in reflection as a lifelong practice” (p. 192). Also, if preservice teachers

learn how to collaborate in addition to reflecting through lesson-study, then that teacher will have the skills to carry it over into their professional careers.

Preservice education programs which incorporate lesson-study throughout students' programs could require these students to meet a certain amount of times throughout each semester of field experiences. The students could be given a form that guides the dialogue related to their field experiences. Guided dialogue can be especially useful when students are in their student teaching semester and are designing long units for the classroom. Though the students will likely be placed in different classrooms during field experiences, having a group of peers who understand the requirements of the other teachers lesson plans can help greatly. The peers can encourage each other as well as grow professionally from each other.

Theoretical Framework

The theoretical framework that guided this study was based on Bandura's (1977) theory of social learning. This theory proposes that people are more likely to perform in some way if they feel it will be successful. This theory is not new to studies of self- efficacy in education (Bleicher, 2004). According to Bandura (1977), "...expectations of personal efficacy are derived from four principal sources of information: performance accomplishments, vicarious experience, verbal persuasion, and physiological states".

Bandura's (1977) first principal source, performance accomplishments, can be achieved through lesson-study many times. While the lessons in lesson-study are only presented by one team member at a time, the success of the lesson is a shared event. All group members put in equal amounts of work throughout the lesson-study process which gives ownership of the lesson

to each group member. If lesson-study is carried out throughout a teacher education program, each teacher candidate would have many experiences as the presenter of the lesson.

The second principal source defined by Bandura (1977), vicarious experiences, can easily be seen in lesson-study. As stated before, only one member of a lesson-study group presents the lesson while other team members observe student learning and overall lesson flow (Lewis, 2002). This allows observing group members to live the lesson vicariously through the presenting team member. While all team members helped to develop the lesson, the presenter often times brings out their own unique teaching style and techniques. This can allow the observing team members to compare their teaching style and techniques to the presenters' and make improvements as needed.

Bandura's (1977) third principal source, verbal persuasion, can also be obtained through lesson-study at the preservice teaching level. With the continuous state of collaboration in lesson-study, teacher candidates can support one another verbally by encouraging each other throughout each stage of teaching. Through verbal persuasion, teacher candidates may become more confident in their particular area of struggle.

Bandura's (1977) fourth principal source, psychological states, could also be positive through lesson-study at the preservice teaching level. After the presentation of a lesson, the group members reflect how the lesson went in regards to student learning (Lewis, 2002). They discuss which aspects of the lesson went well in addition to which aspects of the lesson did not go as desired. The group succeeds and fails together. When the group succeeds together, there are many feelings of satisfaction associated within the group. When the group fails together, no

one member is alone in the failure. This can alleviate an aspect of overwhelming stress from some individuals because it was not their failure alone.

Lesson-study can tap into each of Bandura's (1977) principal sources of self-efficacy in positive ways at the preservice teaching level. By addressing these sources at the preservice teaching level, self-efficacy towards science could be high going into the field of teaching. This could be accomplished as a result of preservice teachers leaving their teacher education programs with many positive experiences in their field of study.

Preservice Science Teacher Self-Efficacy

Duran, et al. reports that educational researchers have demonstrated that science is not being taught by many elementary teachers because of, in large part, a lack of content knowledge (Duran, Ballone-Duran, Haney, & Beltyukova, 2009). With the elevated interest in producing more students into STEM careers as well as raising scientific literacy, not only does science need to be a focus subject taught in elementary, but quality inquiry lesson plans need to be used to yield greater student understanding of the content.

Low self-efficacy towards science by teachers could be an underlying issue causing science to be avoided by many elementary teachers. Bandura (1997) defines self-efficacy as “the beliefs in one’s capability to organize and execute the courses of action required to produce given attainments (Bandura 1997, p.3)”. Teacher self-efficacy is important to examine when understanding why some teachers excel with teaching inquiry-rich lessons while others do not. “Teachers with a high level of teacher self-efficacy have been shown to be more resilient in their teaching and likely to try harder to help all students to reach their potential. In contrast, teachers

with a low level of teacher self-efficacy have been found to be less likely to try harder to reach the learning needs of all their students” (Pendergast, Garvis, & Keogh, 2011, p. 46). Duran, et al. (2009) also reports that problems with elementary teachers’ attitudes, self-efficacy and beliefs towards teaching science is not a new problem. With this in mind, there is a need to help elementary teachers feel more confident in teaching science, therefore, increasing their self-efficacy. Lesson-study could be the answer to this problem. Through lesson-study, misunderstandings of content come up organically in discussions (Lewis, Perry, & Hurd, 2004). By having teachers at the same level work together to tackle misunderstandings of the content, self-efficacy toward science could increase. In the event that the lesson-study group does not understand the content fully, they are encouraged to seek help from outside sources on the topic such as educational researchers, content experts, or research articles (Lewis, Perry, & Hurd, 2004). Also, as discussed before, lesson-study allows teachers to observe each others’ teaching. Through this experience, teachers may learn new aspects of science content as well as new teaching techniques that would make teaching science more approachable.

According to Bursal (2012), teacher preparation programs’ science methods courses may be the final opportunity to target future teachers’ self-efficacy toward science. During these courses, teacher educators must have the goal of implementing instruction that targets numerous aspects, thus preparing preservice teachers to implement high-quality science instruction (Bursal, 2012). During Bursal’s (2012) study, 55 participants who were preservice elementary teachers from an American university located in the mid-west participated. This mixed- methods study examined Bandura’s (1977) four principal sources of information derived for self-efficacy which

are: performance accomplishments, vicarious experience, verbal persuasion, and physiological states. Performance accomplishments, or mastery experiences, are recognized as the most influential factors related to self-efficacy (Bandura, 1977). Interviews and surveys were used as data sources through this study. Mastery experiences were found in this study to contribute to higher levels of self-efficacy toward science teaching. This study adds to the literature the importance of including opportunities for mastery experiences in science methods courses (Bursal, 2012).

Conclusion

It is important for the U.S. to focus on ways to improve science achievement and literacy at the K-12 level (NRC, 2012). Research has shown that lesson-study has many benefits for inservice teachers as well as preservice teachers such as replacing mentoring duties, improving instruction, occurring in the classroom, and valuing the teacher (Lewis, 2002; Lewis & Tsuchida, 1998; Lewis, Perry, Hurd & O'Connell, 2006; Stigler & Hiebert, 1999). Lesson-study at the preservice teaching level could provide a means to enhance future K-12 science education classrooms in the U.S. Before lesson-study is introduced to schools in the U.S. on a wide scale, research is needed to examine if they can adapt to the requirements of lesson-study. This study has deemed those requirements collaboration, observation, and research.

Before implementing a lesson-study program in a teacher education program, it would be beneficial to determine if lesson-study helps to improve science education by increasing self-efficacy towards science teaching. If so, lesson-study would be an excellent addition to a teacher education program as it would produce teachers who are confident in teaching science. Another

topic that should be examined is how well preservice teachers respond to the three aspects of lesson-study outlined in Chapter 1, which are, collaboration, observation, and research. A final area of focus that needs to be examined with lesson-study would be if using lesson-study at the preservice teacher level increases the quality of lesson planning. This study incorporated all of these areas of focus.

This quasi-experimental study sought to quantitatively examine the effects of lesson-study on self-efficacy towards science teaching with preservice elementary science teachers in North Mississippi. Additionally, this study qualitatively explored how well preservice teachers adapted to the three aspects of lesson-study: collaboration, observation, and research. This study also had an element of emerging design as the researcher examined lesson-study at the preservice elementary teaching level.

CHAPTER III

Methodology

This quasi-experimental study took place at a comprehensive university located in Northeast Mississippi. The treatment group was one section of an elementary science methods course offered in the second summer terms of 2013 which received the intervening treatment of lesson-study. An additional section of this class, offered in the first summer term of 2013, was used in the study as a control group and did not receive the intervening treatment of lesson-study. Each of the summer terms was approximately four weeks. The teacher candidates were required to take this methods course during the semester prior to student teaching. Teacher candidates enrolled in the class were asked to voluntarily participate in the study. The total number of participants was 46 elementary preservice teachers. The alternate hypothesis was that the treatment groups' self efficacy would significantly increase more than the control groups' class scores on the STEBI-B instrument (see Table A1) at the .05 alpha level. In the following paragraphs, the design, instruments, procedures and data analysis are described for both the quantitative and qualitative aspects of this study.

Research Design

This study employed a quasi-experimental design outlined in Table 1. The quasi-experimental design was chosen because random assignment to two groups was not possible. However, this type of study, if carefully designed, yields useful knowledge (Gall, Borg, & Gall, 1998). The nonequivalent control-group design was used as a result of the fact that groups were not randomly assigned. Both groups were given a pretest and posttest to determine whether the groups were similar at the onset of the study. A pretest was administered and a t-test was used to determine differences between the lesson-study and non-lesson-study groups. At the conclusion of the study, the posttest scores of the lesson-study and non-lesson-study group were statistically examined and compared to determine if the lesson study groups' self-efficacy increased more than the non-lesson-study groups'. Table 1 describes the experimental design of the study.

Table 1 <i>Experimental Design</i>					
Group	Assignment	n	Pretest	Treatment	Posttest
1	Selective	24	STEBI-B	non-lesson-study	STEBI-B
2	Selective	30	STEBI-B	lesson-study	STEBI-B

Descriptive statistical information was obtained from teacher candidate interviews, a peer evaluation rubric (Sumrall & Mott, 2010) (see Table 3), observation field notes, and a “Mini Lesson Rubric” (see Table 4), in order to pull themes about how the teacher candidates perceived they and their group mates performed on the three aspects of lesson-study: collaboration, observation, and research. The purpose of the descriptive element of this study was to determine how teacher candidates perform on the three aspects of lesson-study outlined in Chapter 1.

Instrumentation

The instrumentation used in this study was observations, teacher candidate interviews, a rubric to assess quality of lessons in both classes, a peer evaluation rubric, and the Science Teaching Efficacy Belief Instrument (STEBI) developed by Enochs and Riggs (1990) and modified by Bleicher (2004). The STEBI-B was developed as an adaptation to the STEBI-A which was designed for use with inservice teachers (see Table A1). The STEBI-B has been adapted and found to be effective in measuring self efficacy in science teaching with preservice teachers. This instrument was tested for reliability and internal validity and modified by Bleicher (2004). The modified version of the STEBI-B (Bleicher, 2004) was used in this study to measure the effect on the teacher candidates' efficacy toward science teaching. Both the control group and treatment group classes were given the survey at the beginning and end of the semester. The STEBI-B served as the quantitative form of instrumentation.

Teacher candidate interviews were conducted at the end of the treatment class (see Figure A1), while observations were conducted throughout both classes. The teacher candidates' interviews and observations focused primarily on how the teacher candidates adapted to the three aspects of lesson-study outlined in Chapter 1: collaboration, research, and observation. Emerging design also played a role in this study as the researcher examined other aspects of lesson-study in which preservice teachers found success and struggled with (Cresswell, 2009).

To assess how well the group members handled the three aspects of lesson-study, a peer evaluation rubric was used for the teacher candidates to assess one another (see Table A3). This rubric was adapted from Sumrall and Mott's (2010) "Design, Construction, and Fiscal

Management Rubric” to reflect observation and research in addition to collaboration (Sumrall & Mott, 2010). Each teacher candidate gave an anonymous grade based on this rubric to every member of their group. The researcher discussed the importance of grading this rubric honestly and great measures were taken to insure anonymity. The information obtained from this rubric was used to supplement the teacher candidate interviews regarding the three aspects of lesson-study.

The quality of the lesson plans were graded using a rubric that has been used for several years by the science methods professors at the University of Mississippi. Two Teacher Education Graduate Assistants from the University of Mississippi graded the quality of the teacher candidates’ lesson plans in both the control and treatment group classes using the “Mini Lesson Rubric” (see Table A4). The researcher evaluated the scores by comparing the means of the non-lesson-study and lesson-study classes.

Procedure

In the past, a “science mini-lesson” assignment (see Figure A2) has required teacher candidates to be grouped together by science content area topic. Each member in the group was required to write a one-day lesson based on the group topic. Teacher candidates were allowed and encouraged to collaborate and work together to develop the individual lessons. Once the lessons were written, the group members would present the individual lessons to other members in their topic group. Three separate grades were given for the assignment to each teacher candidate: one from the instructor, one from the group members, and one self- evaluation grade.

This assignment already had many aspects that resembled lesson-study. Through this study, this assignment was further conformed to a lesson-study approach in the treatment class, while in the control class the assignment remained the same except the teacher candidates in the control class presented the individual lessons twice to different groups in the class. For the treatment class, instead of the teacher candidates working on individual lessons within a group, each whole group in the class worked on one lesson collaboratively throughout the semester. For each of the two terms of the treatment class, the classes were divided into four groups. The different groups presented to other different groups within the class and in turn, observed the other groups presentation. On another day, the teacher candidates presented to a group that they did not previously present to, and in return observed their lesson. This assignment was worked on throughout the four weeks of each term. A diagram representing this is shown in Figure 1.

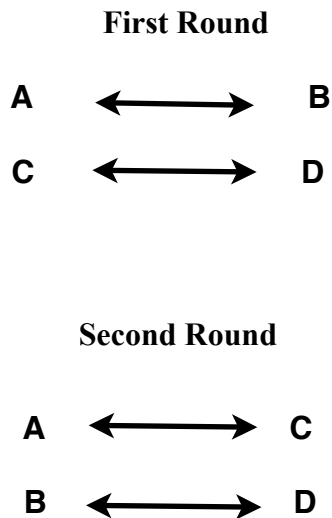


Figure 1: Group Teaching Assignment

As stated earlier, teacher candidates in the control class were assigned a topic group yet they were responsible for individual lessons. Collaboration amongst group members was encouraged, but not required. Teacher candidates were grouped into four groups according to topic (A, B, C, D). Each teacher candidate in the group was assigned a number (1, 2, 3, 4, 5). The first round of teaching, teacher candidates within a group presented their lesson to their topic group. In the second round of teaching, teacher candidates assigned the number 1 taught their individual lessons to other teacher candidates assigned number 1. Teacher candidates assigned the number 2 taught their individual lesson to other teacher candidates assigned number 2 and so on.

Week One

During the first week of each term, the assignment was explained and the researcher asked teacher candidates to participate in the study on a voluntary basis. The STEBI-B was administered to both the treatment section and the control section. For the treatment class, the researcher explained what lesson-study consisted of and showed a video of lesson-study being carried out (see Figure A3). The researcher also showed Lewis' (2002) outline of the stages of lesson-study and explained each stage (Lewis, 2002) (see Table A5). The treatment class was also given the lesson-study guide (Cerbin & Kopp, 2011) (see Table A6) and information regarding how to record student responses during the lesson. The researcher guided the whole class to develop a research theme based on the hand-out for the lessons to be based around. Then each group designed their lesson to reflect the research theme.

For the control class, during the first week the assignment was given with no information regarding lesson-study. Throughout the first week, the teacher candidates in both sections were instructed to work on their assignment (see Figure A2) both in and out of class. The teacher candidates in the treatment class worked in their assigned groups to design one lesson. The teacher candidates in the control group were divided into groups and were encouraged to collaborate with one another but each individual was responsible for developing a lesson.

Week Two

During the second week of the treatment class term, each group of teacher candidates presented their lesson to another group in the class. In return, the group (e.g. A) which they presented to (group B) then presented their (A) lesson to them (B). For the treatment class, one member was chosen out of the group to present the lesson, while other members in the group took notes on the lesson and student learning. Each group in the treatment class was instructed to debrief following their lesson.

During the second week for the control class, each individual group member presented the lesson to his/her assigned group. Each group member also listened to the other group members present their lesson. No further instructions were given.

Week Three

During the third week of class, the treatment class revised their lesson based on the debriefing comments. The control class was simply told they would present the same lesson to a different group in week four. If they chose to revise, it would be on the groups' own initiative.

Week Four

During the fourth week of class, each group in the treatment class presented to a different group from the second week and also observed the lesson of that group. Each group then debriefed again on how their lesson went and turned in a final draft. The researcher made copies of all the groups' lessons to distribute to the whole class. This was to mimic how Japanese teachers share their lesson-study work with their peers. For the control class, the teacher candidates were regrouped by number and presented the lessons a second time. The STEBI-B was administered again for both the treatment and control class. The final lesson plans were graded by two graduate assistants. The "Peer Evaluation Rubric" was used in the treatment class by each student. After completion of the final lesson plans, four students, one from each group, were randomly chosen to be interviewed about the lesson study process.

Data Analysis

The nonequivalent control-group design was used since the students were not randomly assigned to the groups. The STEBI-B was used to collect pre and posttest data for teacher candidates in the lesson-study and non-lesson-study classes. By using the pretest at the onset of the study, pre-existing group differences were examined to minimize the main threat to internal validity. An independent t-test was used to determine statistical differences between the two groups.

Descriptive information from the study was used to find patterns and themes. Interviews and observation notes were transcribed, read and coded. The initial coding was based on

collaboration, research and observation. Emerging design also played a role in the coding process of interviews and observation notes.

Finally, the peer-grading rubric was conducted by all members of the treatment group. The researcher analyzed the scores to see how well students carried out lesson-study based on their peers. Attention was given to see which of the three aspects of lesson-study (collaboration, research, and observation) students excelled and struggled with.

The quality of the lessons produced by the control class and the treatment class were examined. A rubric (see Table A4) was used by two graduate assistants at the University of Mississippi to grade the tests. The graduate assistants were used to prevent bias.

Limitations

There were limitations to this study. One limitation of the study was the short time frame in a summer term for the students to learn the nature of lesson study. From the interviews and observations, it was evident the teacher candidates needed more time to adapt to the requirements of lesson study. Another limitation of this study was the absence of an appropriately aged audience for the lessons. It was difficult for many of the teacher candidates to pretend they were teaching to elementary students when actually presenting to their peers. For this reason, sometimes the teacher candidates would simply tell what they would do if in a real classroom instead of actually performing it. These limitations could have been the cause of the negative comments in the interviews as well as the negative observations made by the researcher.

CHAPTER IV: RESULTS

Results

This chapter contains the results of the study. Results are given after each hypothesis. A total of 46 participants combined between the control and treatment group classes constituted the sample. All participants' scores are included in the data analysis.

Hypothesis

The alternate hypothesis stated that the treatment groups' STEBI-B scores (n=16) would significantly increase more than the control groups' class scores (n=30) at the .05 alpha level between the pretest and posttest administration. The full list of scores of both class's pretest and posttest are included in Table A7. The mean and standard deviations from the STEBI-B instrument for participants who were instructed in the lesson-study class and the non-lesson-study class are shown in Table 2.

Group	Number	Variable	Mean	Standard Deviation
Treatment Class	16	Pretest	86.4375	8.01639
		Posttest	89.6250	11.65547
Control Class	30	Pretest	82.0000	7.65641
		Posttest	84.4667	8.66516

Note. Control and treatment pretests as well as control and treatment posttests were compared at the .05 alpha level.

An independent t-test was conducted using SPSS software on the pretests of the treatment and control groups to determine if the groups were significantly different at the beginning of the study. In the Levene's Test for Equality of Variances at the .05 alpha level, the groups were found to not be significantly different based on the pretest scores of the STEBI-B instrument. This allowed for the posttest scores to also be analyzed using an independent t-test in the SPSS software. The Levene's Test for Equality of Variances revealed that there was not a significant difference between the results of the posttest at the .05 alpha level. Therefore, the experimental hypothesis was rejected. However, according to Table 2, the mean score was higher for the lesson-study group's posttest. Since there was not a significant difference between groups at the onset of the study, this point is worth noting.

Descriptive Analysis

As stated in Chapter 3, descriptive statistical information was obtained from teacher candidate interviews, a peer evaluation rubric (Sumrall & Mott, 2010), observation field notes,

and a “Mini Lesson Rubric”, to identify themes related to performance on the three aspects of lesson-study. The performance areas that were a focus of this study were collaboration, observation, and research as outlined in chapter one. Stigler and Hiebert (1999) highlighted the importance of each of these areas for lesson study to be successful. The remainder of this chapter will focus on the descriptive statistical information obtained through the study.

Teacher Candidate Interviews

Four teacher candidate interviews were held after the second round of teaching for the treatment group. Questions on Figure A1 were followed throughout the interviews. One member from each group was randomly selected to be interviewed. The interview transcriptions are shown in Appendix B. The results of coding the interviews conducted by the researcher on the themes of collaboration, research, and observation, are shown in Table 3.

Table 3
Coding of Interviews

Interview #1 Group B	Research	Collaboration	Observation	Other
Positive	1	10	6	10
Negative	7	10	0	0
Neutral	3	1	0	0
Interview #2 Group A	Research	Collaboration	Observation	Other
Positive	0	3	2	5
Negative	7	2	0	0
Neutral	0	0	1	0
Interview #3 Group C	Research	Collaboration	Observation	Other
Positive	1	14	3	19
Negative	19	1	3	8
Neutral	3	2	0	3
Interview #4 Group D	Research	Collaboration	Observation	Other
Positive	1	11	3	7
Negative	4	1	0	0
Neutral	2	2	2	0

Coding of Interviews

According to Table 3, each interviewee had more positive comments than negative or neutral comments regarding lesson study during the interviews. When each theme was dissected, however, certain aspects of lesson study were preferred more than others by the teacher candidates. There were 37 negative, three positive, and eight neutral comments regarding how well the interviewees felt their group did with the research aspect of lesson study. These comments were coded in regards to negative feelings toward the research aspect. A negative comment was recorded for comments that revealed misunderstanding by the teacher candidates about aspects of lesson study.

For the collaboration theme, there were 38 positive, 14 negative, and five neutral. During the coding process, the researcher marked a negative point if teacher candidates responded that they generally agreed with one another and did not challenge each other. According to Parks (2009), this scenario could lead to teacher candidates supporting novice teaching habits. While there were 14 negative comments, there were more positive than negative comments regarding the collaboration theme.

In the observation theme, there were 14 positive, three negative, and three neutral comments. Two of the groups created very well designed rubrics to assist with the observation aspect. These rubrics were discussed during the interviews. The other two groups initially had problems understanding their role as observers, but once they understood, they were successful with the aspect of observation.

The final category the researcher coded for was other comments regarding lesson study that fell out of these three categories. In this “other” category, there were 34 positive, 8 negative, and 3 neutral comments regarding lesson study. Most of these comments regarded how the teacher candidates felt overall toward lesson study. Most responses were very positive.

Mini Lesson Rubric

An outside source was recruited to grade the mini lesson’s quality using the “Mini Lesson Rubric” (see Table A4) for the control and treatment group. A perfect score was a 30. The scores are listed in Table 4.

Table 4			
<i>Mini Lesson Rubric Scores</i>			
Control Individual Student Scores		Treatment Group Scores	
Student	Score	Group	Score
1	27	A	28
2	25	B	30
3	20	C	29
4	27	D	30
5	29		
6	15		
7	28		
8	30		
9	25		
10	29		
11	27		
12	30		
13	29		
14	28		
15	29		
16	29		
17	30		
18	30		
19	21		
20	25		
21	29		
22	29		
23	28		
24	28		
25	29		
26	28		
27	30		
Control Average= 27.19		Treatment Average= 29.25	

In Table 4, it is important to note that there were 30 individual scores for the non-lesson-study group because each teacher candidate was responsible for his/her own lesson. In the lesson-study group, there were only four grades because students worked within their groups and

only turned in one lesson per group. According to Table 4, the total average for the lessons created by the study groups was higher than the individualized lessons.

Mini Lesson Rubric Graded by Peers and Self

The “Mini Lesson Rubric” was also used to grade peers and self during the treatment group. Table 5 displays the results of these scores.

Table 5								
<i>Mini Lesson Scores Graded by Peers and Self</i>								
1st Round	B Grading A	A Grading self	A Grading B	B Grading self	D Grading C	C Grading Self	C Grading D	D Grading Self
	18	17	30	24	30	30	30	30
	10	19	28	30	30	X	30	30
	16	25	30	X	30	X	30	30
	X	25	30	X	30	X	30	30
		26	28	X				
AVG	15	22	29	27	30	30	30	30
2nd Round	C Grading A	A Grading Self	D Grading B	B Grading Self	A Grading C	C Grading Self	B Grading D	D Grading Self
	30	30	30	30	30	30	26	30
	30	29	30	30	30	30	30	30
	X	30	30	28	29	30	30	30
	X	30	30	29	30	30	28	30
		28	28	X	30		30	
AVG	30	29	30	29	30	30	29	30

Note. The average scores are rounded. The X’s represent data that was not turned in by the student. A perfect score was 30.

According to Table 5, in the first round of teaching with groups A and B, group A scored themselves much lower than they scored group B. Group B scored themselves much higher than they scored group A. It is important to note that during the first round of teaching, group A came unprepared to teach a lesson. They told the group what they planned to do for the next round of

teaching instead of teaching during the first round. Group B was very prepared for their lesson in the first round of teaching. Groups C and D both were prepared for the first round of teaching. Both groups scored the other group a perfect score as well as graded themselves with a perfect score.

In the second round of teaching, group C and A scored each other a perfect score. Group C scored themselves a perfect score and group A gave themselves a 29. Group B scored themselves and group D a 29, while group D scored themselves and group B a perfect score.

Peer Evaluation Rubric

Table 6 represents the results from the “Peer Evaluation Rubric” which was modified from Sumrall and Mott’s (2010) instrument. Teacher candidates used this instrument to grade their group members on how well they performed the three aspects of lesson study outlined in chapter one: collaboration, observation, and research. Groups (A), (B), and (D) all scored one another very high, while group (B) scored each other lower. Group (B)’s results could have been because of personality differences or because some group members did more work than others.

Table 6: Peer Evaluation Rubric Scores

Group	Participant Number	Participant Score	Average Group Score
A	1	9	9
	2	9	
	3	9	
	4	9	
	5	9	
B	6	9	8
	7	8	
	8	7	
	9	9	
	10	8	
C	11	9	9
	12	9	
	13	9	
	14	9	
D	15	9	9
	16	9	
	17	9	
	18	9	

Note. Adapted from Sumrall & Mott (2010). The scores reflected in the table represent the averages of the participants scores. A perfect score was nine.

Observation Field Notes

TREATMENT CLASS

Date: June 27, 2013

Class: EDEL 404, second summer term

Location: Oxford, MS

This was the first day of class. I discussed with the students the process of lesson study and also gave instructions to the students on the assignments related to lesson study that would be happening in this class. The oral consent script was read and participants were asked to volunteer for participation in the study.

Date: July 8, 2013

Class: EDEL 404, second summer term

Location: Oxford, MS

During the class, the researcher cleared up logistics of the assignment details. Four groups were assigned to participate in the lesson study. Group A consisted of mostly traditional students who seemed to be just going through the motions of the class and the lesson study requirement. Candidates in Group B had conflict issues where one person seemed to be the dominant voice in the group, while other members were not contributing their part of the assignment of lesson study. Group C and Group D both consisted of nontraditional students who were more mature than the other groups. They were doing a great job collaborating. Each group needed to be prompted to decide what they were going to observe during the lesson study.

Date: July 10, 2013

Class: EDEL 404, second summer term

Location: Oxford, MS

Today, the groups presented their lessons for the first time. Group D presented to Group C, and vice versa. Group B presented to Group A, and vice versa.

Group A was not prepared for their activity. Instead of bringing their activity and presenting it to the other group, they told the other group what they planned to do in the second round of teaching. There was also confusion in this group about the observation portion of lesson study. They did not have distinct roles for observing. The lesson they were planning to present appeared to be piece-milled together by the group members. The group was not communicating with each other.

Group B was very focused on meeting the research theme designed by the class at the beginning of the semester. They made their own rubric for the observation portion of lesson study which examined collaboration/work skills and critical thinking skills. This group was very prepared.

Group C was presenting on weather. The group had decided, after being prompted, to observe student reactions, and what to do to improve collaboration. A couple of teacher candidates were at first wanting to observe the teaching of the lesson.

Group D presented on plants. They had a good grasp of what they should observe during the lesson. They decided to observe: collaboration, critical thinking, and general flow. During the debrief of the lesson, the teacher candidates had very good discussions on the flow of the lesson.

Date: July 15, 2013

Class: EDEL 404, second summer term

Location: Oxford, MS

During this class, I observed the groups working on their revisions. I went around from group to group answering questions. Group B, C, and D were confident and said they knew what they were doing. Group A seemed to be confused and not really interested. Group A left class earlier than the rest of the groups.

Date: July 17, 2013

Class: EDEL 404, second summer term

Location: Oxford, MS

This was the second teaching of the mini lesson. Group C and Group D presented to each other. Group C had made big changes to the way the lesson was presented. I told group C that observers shouldn't participate in the lesson, but they still participated. They did a condensed version of the lesson. The presenter was not completely prepared with the logistics of the lesson in Group C. This demonstrates how this could be good practice for preservice teachers to work with one another and practice the act of getting prepared for a lesson. Both C and D groups did a good job of making the topic relevant. It was hard for some participants to pretend they were speaking to kids.

Group A did not take presenting the lesson seriously. The lesson did, however, include inquiry. It would have been good to collect written reflections from each person on their lesson.

Group A observing members assisted with the lesson flow some. Following the lesson, during the debrief time, Groups D and B did not debrief as much as A and C.

CHAPTER V

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter presents conclusions and a discussion of the results of the study. Recommendations for further research are also presented. The purpose of this quasi-experimental study was to examine if lesson-study could be a successful approach in regards to improving lesson plan quality and increasing self-efficacy levels toward teaching science at the preservice elementary teacher level in North Mississippi. This study described the experiences of preservice teachers engaging in lesson-study at a comprehensive university in northeast Mississippi.

Analysis of Data

This study lasted for the period of one summer at the University of Mississippi. The independent variable was the intervening treatment of lesson study used with teacher candidates. The dependent variable was the level of efficacy towards science teaching by the teacher candidates. The alternate hypothesis for this study , which was that the treatment groups' STEBI-B scores would significantly increase more than the control groups' class scores at the .05 alpha

level between the pretest and posttest administration, was rejected. The following paragraphs provide a discussion of the findings based on the study.

The study focused upon significant differences in self-efficacy towards science teaching. Based on the literature review, low self-efficacy is not a new problem with elementary teachers ((Duran et al., 2009 ;Pendergast, Garvis, & Keogh, 2011). The researcher addressed this issue with a possible solution; lesson study. Prior to the study, the researcher identified themes that emerged from the literature review that contributed research, collaboration, and observation as critical components of lesson study. The following paragraphs will discuss how these components were observed in the study.

Theme One: Research

Research was one of the first steps of lesson study, prior to beginning the process of lesson study. The researcher followed the suggestion of Lewis's (2002) work and guided the class to select a research theme for each lesson study group to follow, this was to be a broad theme (Lewis, 2002). The class decided to make the research theme related to guiding their students to work well together and develop critical thinking skills.

Once the theme was decided upon, teacher candidates were prompted by the researcher to find well developed lessons based on research to begin their lesson study (Lewis, 2002). The teacher candidates were then instructed to take these research based lessons and adapt them for their needs and also adapt them to the research theme determined as a class.

Through the interviews, it became evident that the teacher candidates confused research-based lessons for piece-milled lessons from a source such as the Internet, or they would make a

new lesson from scratch. In the following paragraphs, each interview is discussed in regards to the topic of research.

Interview One: Group B

Through her interview, the researcher made the observation that the teacher candidate was confident that her group had fulfilled the research requirement. She stated that the group had found some sources online and also had created much of the lesson plan themselves. While the teacher candidate expressed that they were successful in this component of the process, they were missing the point of finding an already well-developed research-based lesson plan to adapt to their needs. Through coding the interview, the researcher found seven statements that were negative about the research aspect within this group, mainly because they did not have a good understanding of what was required. There was also one positive statement and three neutral statements regarding research that was coded during this interview. In summary, though the teacher candidate felt their group was successful with the research aspect, the group lacked a solid understanding of the research requirement of lesson study.

Interview #2: Group A

The second interview revealed that Group A had a misunderstanding of research within the lesson study process. They also piece-milled their lesson together using various sources. During the interview, the teacher candidate representing group A stated that they had some confusion on finding some of the requirements when asked the question about how research went. The teacher candidate seemed to be identifying their research criteria as that of just completing the requirements listed on the rubric of the assignment for the lesson. The coding of

the interview proved that there were no positive or neutral comments regarding the research portion, only seven negative comments.

Interview #3: Group C

The coding of the interview with the representative from group C showed more negative than positive comments. There were nineteen negative, one positive, and three neutral comments regarding research during the interview. Through the interview, the teacher candidate stated that they did not feel it necessary to find a lesson that had already been developed because it was easier to just pull from different resources and come up with their own. This goes against the lesson study goal of finding a well-developed research lesson to modify for own needs.

Interview #4: Group D

The coding from the fourth interview (Group D), also had more negative than positive comments regarding research. There were four negative, one positive, and two neutral comments regarding research. This group, instead of pulling various sources from online, pulled from past experiences. The group did not look for well-developed research lessons to modify.

Theme Two: Collaboration

Interview #1: Group B

The teacher candidate representing group B stated that during the lesson study process, collaborating was a strength and a weakness. She talked about the problems within her group of how the work was not distributed evenly. Some of the students did not pull their weight, however, she and another student collaborated very well together. The coding of the interview

revealed that she made three positive statements, three negative statements, and no neutral statements regarding lesson study.

Interview #2: Group A

The teacher candidate representing Group A revealed through the interview that her group collaborated well. When asked if they had meaningful discussions where they challenged one another, she said they built upon each others ideas. From the interview, it seemed as if the group worked well together and split up the work evenly. While this was not the ideal form of research where they worked together on all aspects of the planning, the group dynamic was good for collaboration. The coding for the collaboration revealed that there were three positive comments, two negative comments, and zero neutral comments regarding how their group collaborated.

Interview #3: Group C

The representative for Group C discussed how the group worked well together. The group built upon each others' ideas in a respectful way. Through the interview, the coding revealed that there were fourteen positive, one negative, and two neutral comments regarding collaboration in lesson study.

Interview #4: Group D

The representative from Group D discussed how collaboration was conducted well in their group. There were eleven positive, one negative, and two neutral statements regarding collaboration from the coding of the interview with the Group D representative. This group also did not debate or challenge one another, but instead built upon one another's ideas. The

representative stated that collaboration is important and spoke positively about Group D's experiences collaborating together.

Theme Three: Observation

Interview #1: Group B

For the observation aspect of lesson study, the teacher candidate representing Group B made two positive statements, zero negative, and one neutral statement regarding their observation efforts. The teacher candidate discussed how they made their own rubric to assist in the observation process. These rubrics were very detailed and aligned with the class research theme.

Interview #2: Group A

From the interview, it was revealed that the teacher candidates within Group A did understand that the observing members of the group needed to be observing different aspects, however, they were not completely prepared for how to observe their specific component because they did not have a rubric or checklist. The observation coding of the interview showed two positive comments, zero negative, and one neutral comment.

Interview #3: Group C

In the interview with the representative of Group C, there were three positive, three negative, and zero neutral comments regarding observation in lesson study. The representative talked about the confusion the group had on how/what to observe prior to the first teaching, but how they then understood once they started. The representative did not bring up any rubrics that

may have been created. It seemed as if the group members each just looked for certain characteristics about the lesson.

Interview #4: Group D

There were three positive, zero negative, and two neutral comments regarding observation coded for Group D's interview. The group seemed to have a good understanding of what to observe and chose to take notes during the lesson instead of using a rubric. The group observed aspects of the lesson which related back to the research theme the class had chosen.

Observations Regarding Themes

Group B:

Through the researcher's observations, it was revealed that Group B understood the requirements of the lesson study assignment for the most part. They did not research as effectively as they should have because they didn't find an already well-developed research based lesson. They instead pieced their lesson together by using various sources and also made much of it up. However, they did meet all the major requirements of the assignment. The collaboration aspect had positive and negative effects within this group, with a couple of students working well together and other students not contributing equal efforts. This group had a firm grasp on the observation portion of lesson study by making their own rubrics that aligned with the research theme the class had developed. The group representative also had an overall positive outlook towards lesson study at the end of the semester.

Group A:

The researcher observed that Group A did not have a very good grasp upon the research portion of lesson study. They used sources to research, but from the interview, it seemed that each member did their own research and added it to the group. It was revealed that Group A generally all got along but they were working on their own and then adding information to the group. Finally, Group A had a minimal understanding of the observation requirement. They had to be prompted in what to do for this component of lesson study.

Group C:

Through the researcher's observations, Group C did well collaborating. The group got along and also built upon each other's ideas. They did need prompting with the observation portion of lesson study because they were confused about what to observe. The group did not have a good grasp upon the research aspect of lesson study. Group C combined various activities to form a lesson instead of searching for a well-developed research lesson to modify.

Group D:

Group D did well collaborating and researching. Group D, like the other groups, struggled with the research component of lesson study. They used past experiences with activities for their research.

Discussion

Group dynamics as well as truly understanding lesson study seemed to play an important role in this study. This study reflected some of the same results that Parks' (2009) study showed with collaboration actually hindering participant learning. Much like in Parks' (2009) study, the

teacher candidates in some groups generally agreed with one another. There were no reports of true debate in any group. While some groups discussed how they changed their minds based on new group member's ideas, most comments through the interview when asked about collaboration dealt with participants generally agreeing with one another and building off each other's ideas. While some groups seemed to work well together, other groups did not get along well at all. There were reports of group members not contributing their part of the assignment. These problems reflect the importance of good group dynamics for lesson study to be successful.

Stigler & Hiebert (1999) discuss the importance of research and observation in the lesson study process. Through this study, none of the groups truly met the research criteria. This could have been because they were not experienced with research in this type of setting. Time could have also played a role in not truly understanding the requirements behind lesson study. If more elaborate training on what it meant to research well-developed lessons had taken place, there could have been different results. Most groups eventually understood the requirements of observation. This, again, could have been more successful with more time devoted to training how to observe.

Perry and Lewis (2008) discussed how in their study, the participants' thinking shifted from viewing lesson-study as a tool to produce a lesson, to viewing lesson-study as a tool to improve instruction over time. This shift was not made in the current study. The teacher candidates were very focused on the end product instead of the process of lesson study. This shift may not have occurred because of the maturity of the participants. The teacher candidates were still thinking like students and looking toward the end result of a grade instead of looking at

all the learning opportunities from their peers as well as research through the lesson study process. This could be because a level of professionalism had not been developed yet in the participants. Lewis, Perry & Friedkin (2011) suggested that the U.S. teachers in their study had problems taking a slower pace with content like Japanese teachers. In this study, similar pace concerns were noted, such as the teacher candidates just looking to meet all criteria of the assignment instead of really trying to understand how to better student understanding through their lesson.

This study revealed many aspects of lesson study conducted at the preservice level. One very important aspect was that sufficient time in training teachers on lesson study needs to occur. Another aspect was healthy collaboration needs to occur for lesson study to be successful. Collaboration skills could also be worked on during a training for lesson study. This study did reveal, however, that there were advantages to lesson study. While not a significant difference, the lesson-study group did perform better on lesson quality than the non-lesson-study group. Also, the lesson-study group scored higher on average than the non-lesson study group on the STEBI-B results. Again, although this wasn't a significant difference, the scores on average were higher for the lesson-study group suggesting there may be some advantages of lesson study with preservice teacher self-efficacy towards science teaching. Finally, the overall coding revealed that there were more positive comments on all aspects of lesson study than negative comments with 54% positive and 46% negative/neutral comments combined. From this information, one could note that it seemed as if the majority of teacher candidates left the experience with a good attitude towards lesson study.

Conclusions

Based on the findings of the research, several conclusions can be drawn. First, the results of the STEBI-B indicated that the treatment groups' scores increased more on average than the control groups' between the two teachings of the lessons. By running the STEBI-B data through SPSS, it was revealed that the scores of the pretest between both groups was not significant, indicating that both groups were similar in levels of self-efficacy towards science. The posttest of the STEBI-B was also run through SPSS software and it showed that there was not a significant difference at the .05 alpha level between the groups' posttest scores. This resulted in the alternate hypothesis that lesson study could increase preservice teacher self-efficacy being rejected. Secondly, positive comments about the lesson study process from the teacher candidates in the treatment group and observations by the researcher revealed that, generally, teacher candidates had a positive reaction to lesson study. Thirdly, according to the outside sources who graded the final drafts of the lessons, the treatment group had greater gains than the control class on average regarding quality of lessons according to the "Mini Lesson Rubric" (see table A4). The fourth conclusion that can be made is the teacher candidates perceived that their fellow group mates did well on the three aspects of lesson study based on the "Peer Evaluation Rubric" (Modified from Sumrall & Mott 2010).

As previously stated, the lesson-study group had greater gains regarding quality of lessons according to the "Mini Lesson Rubric" (see table A4) than the non-lesson-study group according to the results of the lessons being graded by external evaluators for lesson plan quality. The difference in scores between the two groups could possibly have been because the lesson-

study group was instructed to make revisions based on the debriefing sessions, while the non-lesson-study group was given no instructions about revising other than they could revise if they wanted to do such. Trautwein and Ammerman (2010) discussed the importance of reflecting at the preservice level in order to develop lifelong habits of this behavior. This study shows that lesson study is a way to promote reflection/revision behaviors as well as produce better lesson plan quality in teacher education programs.

These conclusions suggested that the lesson study process implemented during the preservice teaching level can be beneficial. However, through the interviews and observations, it was noted that collaboration, observation, and research all had problems. Collaboration is a skill that teacher candidates need to use in their future careers. This opportunity of going through the lesson study process is a great practice in developing effective collaboration skills. Most groups in the treatment class had difficulty in initially understanding their role when observing the lesson. The observing members of the group took more of a team-teaching approach instead of simply observing the presenting member. After the first lesson, half of the groups had a firm grasp on this concept while the other two understood but had a hard time simply observing while the teacher presented the lesson. The research aspect of lesson study was not completely understood by any of the groups. Most groups would just piecemeal their lesson together or they would create parts of the lesson. They did not understand that they needed to take a well-developed lesson and make improvements and modifications based on their needs. More training on how to conduct research prior to the assignment could possibly have helped the teacher candidates in their research.

Recommendations

Observation, Collaboration, and Research

If this study were to be repeated in the future, additional training of the teacher candidates in all three areas of lesson study needs to occur. There were problems with an understanding of all three themes: observation, collaboration, and research. Initially, teacher candidates did not understand observation, but after additional explanation, most groups seemed to have a firm grasp upon the requirements of observing student learning. However, for the collaboration and research aspect of lesson study, teacher candidates should be trained more rigorously.

Collaboration

Group dynamics played a major role in how well collaboration was handled through this study by the teacher candidates. Teacher candidates either got along with one another but failed to challenge and push one another to excellence, or the group members did not get along at all. In addition to instructing teacher candidates that they must work as a group on the assignment, teacher candidates need training on how to work well with other people. This is a life skill that could benefit teacher candidates in their future careers. If group members cannot collaborate well, lesson study cannot succeed as intended.

Research

Additional training is also needed in the research aspect for teacher candidates to be successful with lesson study. Teacher candidates need to be introduced to resources that are considered credible and how to know the difference between resources which are not credible. In lesson study, group members are expected to find a research-based lesson that is already well-

developed and to modify it for the present needs. Teacher candidates should be shown examples of what this process looks like.

Future Studies

Universities that plan on implementing lesson study with their teacher candidates should carefully consider dedicating significantly more time towards training teacher candidates in lesson study. A future study could involve integration of lesson study throughout a teacher education program. The first two years of the program could be dedicated to learning the three aspects of lesson study while the final two years of the program could be dedicated to practicing lesson study during field experiences. A broader study ranging across several universities would also be beneficial. A third recommendation would be to study participants in their years following the lesson study process and see if their efficacy levels remain the same by using the STEBI-B. It would be beneficial to assigned a number for the STEBI-B, so there is a way to track individual progress between the pretest and posttest of teacher candidates. This would add more data to the results of this study which analyzed the overall mean difference of the STEBI-B between the two classes.

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APPENDIX A

Table A1					
<i>Science Teaching Efficacy Belief Instrument-Form B</i>					
Please indicate the degree to which you agree or disagree with each statement below by placing an "X" on the appropriate letters to the right of each statement. SA = STRONGLY AGREE, A = Agree, UN = Uncertain, D = DISAGREE, SD = STRONGLY DISAGREE					
	SA	A	UN	D	SD
1. When a student does better than usual in science, it is often because the teacher exerted a little extra effort.					
2. I will continually find better ways to teach science.					
3. Even if I try very hard, I will not teach science as well as I will most subjects.					
4. When the science grades of students improve, it is often due to their teacher having found a more effective teaching approach.					
5. I know the steps necessary to teach science concepts effectively.					
6. I will not be very effective in monitoring science experiments.					
7. If students are underachieving in science, it is most likely due to ineffective science teaching.					
8. I will generally teach science ineffectively.					
9. The inadequacy of a student's science background can be overcome by good teaching.					
10. The low science achievement of students cannot generally be blamed on their teachers.					
11. When a low-achieving child progresses in science, it is usually due to extra attention given by the teacher.					
12. I understand science concepts well enough to be effective in teaching elementary science.					
13. Increased effort in science teaching produces little change in students' science achievement.					
14. The teacher is generally responsible for the achievement of students in science.					
15. Students' achievement in science is directly related to their teacher's effectiveness in science teaching.					
16. If parents comment that their child is showing more interest in science, it is probably due to the child's teacher.					
17. I will find it difficult to explain to students why science experiments work.					
18. I will typically be able to answer students' science questions.					

Table A1					
<i>Science Teaching Efficacy Belief Instrument-Form B</i>					
Please indicate the degree to which you agree or disagree with each statement below by placing an “X” on the appropriate letters to the right of each statement. SA = STRONGLY AGREE, A = Agree, UN = Uncertain, D = DISAGREE, SD = STRONGLY DISAGREE					
	SA	A	UN	D	SD
19. I wonder if I will have the necessary skills to teach science.					
20. Given a choice, I will not invite the principal to evaluate my science teaching.					
21. When a student has difficulty understanding a science concept, I will usually be at a loss as to how to help the student understand.					
22. When teaching science, I will usually welcome student questions.					
23. I do not know what to do to turn students on to science.					

Note. Adapted from Bleicher, R. (2004). Revisiting the STEBI-B: Measuring Self-Efficacy in Preservice Elementary Teachers. *School Science and Mathematics, 104(8), 383-391.*

Interview Questions

1. How did you like the lesson-study process?
2. What were the strengths of lesson-study?
3. What were the weaknesses of lesson-study?
4. How do you feel that your group collaborated?
5. Did you have meaningful discussions where you challenged each other or did you all generally agree with one another?
6. How well do you feel you observed student learning?
7. How much research did you do to contribute to the lesson plan?
8. How much improvement occurred between the two teachings of the lessons?
9. What are some other comments you have regarding lesson-study?

Figure A1

Table A3				
<i>Peer Evaluation Rubric</i>				
Student Name	1	2	3	Total
Collaboration	Communicates but does not work to solve problems to accomplish the goals of the project—one or two students' opinions are included and others' opinions and ideas are excluded.	Communicates and works to solve some problems, discusses options and possibilities, and addresses different opinions articulated by peers, but does not fully resolve differences through discussion.	Communicates effectively, works to solve problems, discusses options and possibilities, addresses different opinions articulated by peers, and resolves differences through discussion.	
Research	Does not contribute any research to the group	Works to contribute some research to the group	Contributes their part of the research to the group	
Observation	Does not take any notes on student learning	Takes some notes on student learning but are not relevant	Takes excellent notes regarding student learning	

Note. Adapted from Sumrall, W. & Mott, M. (2010). Building models to better understand the importance of cost versus safety in engineering. *Science Scope*, 45-52.

Table A4*Standards-based Mini-Lesson Evaluation Form*

Name: _____ Section: _____ Evaluator (circle one)		Self	Peer	Instructor
Score	Objective			
	<p>Preparation and organization (4)</p> <ul style="list-style-type: none"> • Provided handouts, evaluation forms, science materials and visuals • Used time effectively <p>Content knowledge (2)</p> <ul style="list-style-type: none"> • Provided clear and complete explanations • Integrated content and processes • Presented sufficient and correct background knowledge <p>Visual(s), instructional materials, appropriate assessment. (2)</p> <ul style="list-style-type: none"> • Enhanced presentation with appropriate, engaging, and creative materials • Engaged students in appropriate assessment (what they do to show understanding) • Chose engaging literature or trade books • Used appropriate evaluation instrument (how you grade it) <p>Presentation skills (2)</p> <p>Written work (20) (see assignment description for requirements)</p> <ul style="list-style-type: none"> • 6-E learning cycle (8) • National Science Education Standards (1) • Children’s literature –APA-style citation (1) Remember, no anthropomorphism please • Strategies to address a diverse classroom (both multicultural and special needs students) (3) • Teachers’ background information – the science content and references (2) • Brief bio (short paragraph) of a scientist or inventor relevant to your topic (content or processes) (2) • Myth/Misconception (3) Please plan to try this out with a group of elementary students or with your table partners before you plan the lesson Your question/ prompt/activity used to gather students’ understanding Students’ written work -- just a sample. A brief interpretation and identification of their responses. A brief discussions of correct science concept(s). Explanation of how you would and did consider students’ prior knowledge (myths/misconceptions) in planning your lesson. 			

Standards-based Teaching Mini Lesson Assignment Instructions

You will *present* a 20 minute activity to your small table group using the 6-E learning cycle discussed in class. You will also turn in a handout that includes all of the items listed below for each of your table partners and one for your instructor. All presentation materials must fit into a “teaching box” Please refer to the rubric for this assignment as you prepare your work. In your presentation, include a visual, science materials, and a handout for each member of your table and your instructor. You will complete a self-evaluation on your presentation as well as from peers and instructor. Please provide copies of the evaluation for small group members and instructor. The handout, worth 20 out of 30 points, will include:

- o 6-E learning cycle (8)
- o *National Science Education Standards* (1)
- o Children’s literature –APA-style citation (1) *Remember; no anthropomorphism please*
- o Strategies to address a diverse classroom (both multicultural and special needs students) (3)
- o Teachers’ background information – the science content and references (2)
- o Brief bio (short paragraph) of a scientist or inventor relevant to your topic (content or processes) (2)
- o Myth/Misconception (3) *Please plan to try this out with a group of elementary students or with your table partners before you plan the lesson*
 - Your question/prompt/activity used to gather students’ understanding
 - Students’ written work -- just a sample
 - A brief interpretation and identification of their responses
 - A brief discussions of correct science concept(s)
 - Explanation of how you would and did consider students’ prior knowledge (myths/misconceptions) in planning your lesson

Figure A2

Lesson-Study Example Video Website Link

<http://www.lessonresearch.net/canyoulift1.html>

Figure A3

Table A5*Lesson-Study Schedule*

Number of Meetings	Task	Participants	Activities
1-3	Select research theme, subject area	All groups together	Agree on research theme, based on discussion of long-term goals for students. Select subject area (e.g., mathematics).
3-6	Plan research lesson	Research lesson planning group (4-6) members	Select topic for research lesson. Outline the unit and plan the research lesson. Write thorough instructional plan.
1 (a class period)	Conduct research lesson	Research lesson planning group, other invitees as desired	One member teaches research lesson; others observe and collect data agreed upon in advance.
1	Discuss research lesson	Same as prior step	Discuss data from research lesson soon after the research lesson (same day).
1-2	Reflect-revise	Research lesson planning group	Consolidate what was learned from research lesson and write up reflections. If desired, revise lesson for re-teaching
1 (a class period)	Second teaching of research lesson	Research lesson planning group and invitees or whole faculty as desired	A second group member re-teaches research lesson to one class; others observe and collect data agreed upon in advance.
1	Discuss research lesson	Research lesson planning group and invitees or whole faculty as desired	Discuss second teaching of research lesson soon after the research lesson (same day); revise lesson again if desired
1-2	Reflect-revise	Research lesson planning group	Reflect on lesson-study effort and goals, and continue to modify these.

Note. Adapted from Lewis, C. (2002). *Lesson-Study: A handbook of teacher-led instructional change. Research for Better Schools, Inc., Philadelphia, PA.*

Table A6 <i>Lesson-Study as Research</i>	
Research Process	Guiding Questions
<p>Question How does student learning, thinking and behavior develop in the lesson?</p>	<p>Developing Student Learning Goals</p> <ul style="list-style-type: none"> • What long-term qualities will the lesson support? These are abilities, skills, dispositions, inclinations, sensibilities, values, etc. that you would like students to develop. • What topic will your lesson focus on? Why did you choose this topic? • What specific learning goals will the lesson address? Write these in terms of what students will know and be able to do as a result of the lesson.
<p>Method How do the instructional activities affect student learning, thinking and behavior?</p>	<p>Designing the lesson</p> <ul style="list-style-type: none"> • What preparation do students need to complete before the lesson takes place? • What instructional activities and materials will be used in the lesson? What will be the sequence? • How will the lesson activities make student thinking visible? • In what ways do the lesson activities help students achieve the learning goals? How do you predict students will respond to the lesson? <p>Gathering Evidence</p> <ul style="list-style-type: none"> • What is your plan for observing students? Discuss logistical issues such as who will observe, what will be observed, how to record data, etc. • What observational strategies will you use (e.g., student work and performance related to the learning goal)?
<p>Findings and Discussion What did you learn about student learning, thinking and behavior?</p>	<p>Analyzing Evidence</p> <ul style="list-style-type: none"> • What are the major patterns and tendencies in the evidence? Discuss key observations or representative examples of student learning and thinking. • What does the evidence suggest about student thinking such as their misconceptions, difficulties, confusion, insights, surprising ideas, etc.? • In what ways did students achieve or not achieve the learning goals? • Based on your analysis, how would you change or revise the lesson? • What are the implications for teaching in your field?

Note. Adapted from Cerbin, B, & Kopp, B. (2011). Lesson-Study as research. Retrieved from <http://www.uwlax.edu/sotl/lsp/tools/lessonstudyguidingquestions.htm>.

Table A7*STEBI-B Score Results*

Control Class Pre-test Scores (n=30)	Control Class Post-test Scores (n=30)	Treatment Class Pre-test Scores (n=16)	Treatment Class Post-test Scores (n=16)
76	72	87	76
88	89	88	105
87	75	87	110
73	81	85	69
81	88	77	91
90	87	73	103
74	85	83	92
81	83	95	74
70	91	89	86
82	93	106	95
70	88	75	91
91	84	86	76
74	89	86	87
77	97	93	90
82	75	91	100
81	80	82	89
74	76		
74	78		
87	80		
79	90		
85	81		
77	94		
81	89		
100	94		
92	88		
84	81		
90	55		
90	83		
76	92		
94	96		
Control Class Pre-test Average	Control Class Post-test Average	Treatment Class Pretest Average	Treatment Class Post-test Average
82	84.47	86.4375	89.625

APPENDIX B

INTERVIEW TRANSCRIPTS

KEY: P= Participant, R= Researcher

Interview #1 Christina Britt

R: Okay, Can you tell me your name?

P: My name is Christina Britt.

R: Okay, and how did you like the lesson study process?

P: Um, I liked it, a lot. Do you want to know why?

R: Yes.

P: Okay, um, so I liked this method of teaching, or creating a lesson plan because the first time you do the lesson there are tons of errors, but you don't know about it when you're first teaching it or coming up with the lesson. You think it's going to go one way, but it actually goes another way. So then when your group comes back together to reconstruct it, you can fix those errors, and so it's nice.

R: Good, so um... would you say that's the strengths of lesson study or is there any more strengths you can think of?

P: Well that's definitely a strength but I also liked how we collaborated as a group because it wasn't just my idea, it was the ideas of everyone. So it's like everyone had an input, and then you just bounced off of each other with different ideas. So it's almost like you're not teaching to one person like your method of teaching but like you're; all students are learning a different way. And if you have more people collaborating together you have all those different methods. Does that make sense?

R: That absolutely does. Um, what would you say some of the weaknesses of lesson would be?

P: Collaborating.

--Both laugh--

R: So it's a strength and a weakness?

P: It is because, you also have, I mean you have to collaborate with these people, and if you don't have a good group, its not very.... Or if you have one person who is doing all the work, and the others are just kind of in the back, so you have to have a good group. Good dynamics.

R: Well how do you feel that your group collaborated?

P: Okay, um...

R: And you can be honest, this is just for my stuff.

P: Yeah. My group did not collaborate very well. There were two people who did a lot of the work, and one person who did most of the work. And then there was a few people who just kind of sat back and let it happen.

R: So you think that would be a very negative, because that's going to be the way it is in schools too?

P: Yeah

R: So

P: That was a negative, um, but then at the same time, me and the one person that worked together really worked good together

R: So it was good and bad.

P: Yeah

R: Um, when you were having your collaborating time, did y'all have meaningful discussions like where you're going to challenge each other, like where you kind of had a debate, or did you just all generally agree with each other's ideas as they came along?

P: We debated.

R: That's great!

P: Um hmm.

R: Great

P: Because one person would come up with something and then I would not like it.

R: Oh

P: and it would, like if it didn't make sense or if it was too time consuming or there was problems in there that the other person didn't see, I would bring it up, and then they of course would defend their idea, and then I would defend the fact that they were incorrect. --Both laugh-- So we actually did a lot of debating and a lot of changing and we eventually got it to where we all agreed.

R: Okay, that's good, that's good. Um, how well do you feel you observed student learning? Your group observed student learning.

P: I was very effective because you got to stand back and watch it all unfold. So you got to watch the problems, the strengths. You got to see the whole process so you could fix it!

R: So y'all had a rubric when you observed, tell me about that.

P: Um, well we wanted to make sure that certain things were done, so we created a rubric to measure how much of each thing were being done.

R: Okay.

P: like critical thinking, um we had, like are they coming up with meaningful questions, critical thinking questions, or just what's that kind of question, um, we had collaboration, and we measured that, based on how well they worked together, so, we just measured different things, like did they get along, did they generate ideas together as a group? Um, stuff like that.

R: Awesome.

P: And then we measured it.

R: And then y'all had the rubric which was really good. Um, how much research did you contribute to the lesson plan.

P: Me, myself?

R: Um hmm.

P: A lot

R: Okay, did everybody contribute the same amount...

P: No

R: do you feel? What were some of the outlets you used for research?

P: Well the Internet. I used resources like, um, we did a book from online and we printed it off.

It was for first grade. It was a mini book. And we did a puzzle

R: Nice.

P: Yeah. And we got the idea from online. No we didn't, I came up with that idea all by myself!

R: Look at you!

P: Um, let's see. We got video feed from online. A lot of it was made up. We made up a lot of ours but the resources that we used was from the Internet

R: Okay, great.

P: Is that what you meant?

R: Yeah! That's exactly right. Um, how much improvement occurred between the two teachings of the lessons?

P: Uh, 100 percent.

R: Good, wow, great!

P: Yeah, because we, when we first did it we were like oh my goodness, that needs to be bigger, that needs to be said clearer, that needs to be written down, that needs to be written and said, that needs to be handed out. So

R: But that's good. That's kind of the point. You're seeing how something can be improved, and it could probably still been improved over and over again.

P: Oh yeah!

R: And so...

P: Well the first time was seeing that our lesson plan could actually be confusing the students.

Like where do we go, what do we do, how do we do this?

R: Right.

P: So then the second time when we got it we took that under consideration and we tried to clarify everything, like step by step, so, that was our major thing clarification.

R: Good things. Do you have any other comments regarding lesson study, anything?

P: Um, I think that's it. I would rather use it than anything else. It proved to be positive in the end, even with the negative effects of collaboration, it still proved to be worth it.

R: Great. Thank you, thank you!

P: You're welcome!

Interview #2

R: So, Molly Sanders,

P: Yeah

R: Uh, how did you like the lesson study process?

P: It was good, I mean, we all worked together and were able to plan it together and everybody did their own part and everything, so it worked out nicely. So it was like planning a real lesson that we would do with a science class or something, so.

R: Okay. What were the strengths of lesson study do you think?

P: Um, the strengths of it were, trying to think, like the outline that would tell us like exactly what we needed to do and um, the different components of our lesson plan that we needed and everything.

R: Okay. What about the weaknesses?

P: Um, trying to think.

R: Some of the things maybe your group struggled with or...?

P: We struggled with finding some of the different standards that we needed to meet. Like online stuff. I forgot which one it was but there was one that was hard to find online. And like, we also struggled with trying to develop like for special needs and stuff like that

R: Okay, um how do you feel that your group collaborated?

P: We did good, um, everybody put their ideas together and stuff and we were able to meet up and we were pretty much on the same page with everything, so...

R: Awesome. So did y'all work together on every aspect or did y'all kind of collaborate and each person had their part and you just throw it into the bigger scheme?

P: It's like we'd meet up with each other and then we'd kind of branch off and assign like each person something to do and then send it all in together and then one person would put it all together basically.

R: So it was kind of like a piece meal deal?

P: Uh huh

R: Ok, um, did you and your group have meaningful discussions where you challenged each other or did you all generally agree with each another?

P: For the most part we agreed but somebody, everybody would add to it and bring different points of view you know that we all hadn't thought about and we were able to add to it and make it better so for the most part we agreed.

R: How do you feel that you observed student learning?

P: Like in the?

R: Like when y'all were pretending that y'all were, well when y'all were actually not presenting the lesson but you were teaching the lesson?

P: Uh huh, I think I observed well. I mean it's just kind of watching people and seeing how they, if they grasp the concept and are able to take it and go with it or you're not teaching it right and stuff, so...

R: Did y'all ever come up with a rubric or any kind of guidelines as you observed or did y'all just kind of say, you know, this is what I'm observing?

P: We just said "this is what I'm observing". And we'd have one person observing this and someone else was observing something else.

R: Okay, um how much research did each of your group members contribute to the lesson plan and what kind of research?

P: Um, everyone did their own research. Like, one person would like try to look up books while one person would look up the standards, one person would look up, um like , different types of worksheets to do and facts or resources on the digestive system. So everybody had their part of something to look up and like contribute and everything.

R: Okay, um how much improvement occurred between the two lessons, the two teachings of the lesson?

P: The first time we weren't really that prepared, and then after we did that we knew what we felt like we needed to work on and everything, so the second one was a lot more improved and everything.

R: Do you feel like if you did it again, you can improve more or do you feel like it's kind of where it needs to be.

P: Um, I think ours was good. I think it's not where it needs to be but I think if there was time there is still stuff we could fix or do better on and stuff.

R: Okay, um, do you have any other comments that you have regarding lesson study? Anything that you observed or ?

P: Uh uh. I mean, I observed and it seemed like our teaching was good and the people we were teaching to got it and were able to do the activities sufficiently and everything, so...

R: Okay great! Well thank you, thank you, thank you!

P: I appreciate it!

Interview #3

R: Okay, uh, if you will say your name into the recorder?

P: Leslie Loyd

R: Leslie Loyd, okay. How did you uh, like the lesson study process?

P: Um, like the whole mini lesson process?

R: Just, yeah, well the collaborating and going through the routine of how you would debrief, and...

P: I liked it a lot, I like that we evaluated each other. It let us know what we needed to work on more. I liked the process that it let us do it twice so we could fix what we needed to fix and then um, go back and do it better the second time and stuff. And I liked the debriefing part too.

And, um, we could also let other groups know what they needed to work on and stuff like that. I think it was cool, like compared to lessons I've done in the past because it wasn't as I guess, you got one shot to do it and that's it.

R: Right.

P: Like it was good to fix and work on it and stuff so that was neat.

R: Ok. What were the strengths of lesson study do you think just from this experience?

P: Um, the strengths would be working in a group I think, um made it easier and it, um, and you know everybody throws different ideas and stuff so I liked that. That it was group work type thing. And that, um, we could fix things, go back and make stuff better and stuff like that. I think those were pretty big strengths for me.

R: What about the weaknesses of the lesson study?

P: Um, let's see. The weaknesses, maybe um, I don't know, um (laugh)

R: Did ya'll find any like aspect of it like collaboration or like finding research materials or the knowing what to observe was, which one of those would probably be the weakest?

P: Um, probably okay maybe the fact that just one person presented. Not that the other people didn't put in work because they did.

R: Right

P: But it left it a little uneven maybe.

R: Um hm

P: Um with the work put into it. Um and I know its not, I know its hard to make that even since its a group work and its, its confusing if you have four people presenting but um I guess that would be a weakness. I don't know how you would fix that, but I think that just two people that are presenting. It kind of put a lot of pressure on those people.

R: Right, um hm

P: And um made it a little more um difficult for them

R: Um hm

P: But, so.

R: Okay, uh, how do you feel that your group collaborated?

P: I think we collaborated really well. Um, we all work really well together in a group. Um we, everybody was able to meet when we needed to meet. Um everybody threw in ideas. Everybody um put in work. We didn't you know usually have like one or two people that don't really put in

R: Right

P: the right amount of work but we worked really well together. We have since like the first day so it was really lucky.

R: That's great!

P: Yeah

R: So, when you talked about when you were planning the lesson or revising it, did you guys have meaningful discussions in which you were challenging each other, like with respectful debate were y'all all kind of on the same page and just agreeing with one another.

P: Um, I'd say we were more so agreeing than challenging each other probably. Um, I don't think there was much debate. We, maybe somebody threw out an idea but somebody said something better

R: Right

P: But there was no, like, I think mine is better than yours.

R: Right.

P: Like we pretty much would all agree if like another idea was thrown out that was better than the other. And so we weren't like offended if somebody, you know, topped our idea.

R: Okay.

P: So I think it was more like agreeing.

R: Alright, um, how do you feel like you observed the student learning. Like did you feel prepared to.. Did you know what you were observing?

P: Um, not really but that was probably our fault because we weren't really sure, um, well until the day of really what we were observing. But once we like knew what we were observing we took notes and stuff like that but before the day we were presenting we weren't really sure what we were suppose to observe.

R: Um hm.

P: But, um, I think we, we, we decided what we were going to each observe, like one of us observed what we can improve on. One of us observed the students reactions I guess and how well they, um, responded to the lesson, and, so once we figured out on the day of, I think we got some good notes and some good feedback and stuff.

R: Okay, uh how much research did you personally contribute to the lesson plan and also talk about your group members with that.

P: Um, personally, I pretty much, I found the activity. It was on tornadoes. And I found the um bottle tornado activity online.

R: Um hm.

P: Um, I also found the five w's which we used to kind of like center our lesson around. It was like the five w's of tornadoes: where, where, when, what. I can't remember all of them right now but we found, I found that worksheet and it ended up being pretty much like a central part of our lesson plan, um, because we didn't want it to be too broad...

R: Right.

P: But um, so we were able to find that and then, I believe it was Jordan that found a book that matched the five w's.

R: Oh okay.

P: So, it ended up working out really good. Um, and then so like as far as the other group members like what they researched?

R: Um hm.

P: Jordan found, um, the book. Alex did like, we had an e-search activity

R: Um hm

P: And um, she kind of took charge of that, um. Sarah kind of helped me with the whole, kind of like the overall research on like that central lesson.

R: Okay.

P: And, um...

R: Did you guys use like, when you were researching, did you use any already planned lessons and kind of took it from there to adapt or did you just kind of look for activities here and there...

P: We didn't see...

R: and put it together.

P: We didn't see already, um, filled out lesson.

R: Um hm..

P: Um, I think it was mainly activities that we saw.

R: Um hm..

P: And especially since it's only a one day like twenty minute type lesson thing...

R: Right.

P: We didn't feel like it was necessary to like find an actual lesson and like go by that when we could just easily do our own. So we, I mean, first we thought of weather and then we thought that's really broad. Then we thought about storms...

R: Um hm.

P: And that was still too broad, just because it was you know one day. So we picked our lesson, like our whole, um, like lesson would be on storms but that day would just be on tornadoes.

R: Um hm.

P: So, we picked tornadoes and just went from there. Like we just googled. The first thing I thought of was the little tornado bottle activity.

R: And that worked really well.

P: And so we started off there and then just thought of, okay what could we talk about specifically tornados that day. That twenty minutes and so we just found the five w worksheet and so...

R: Right.

P: we went from there.

R: Okay. Uh, how much improvement occurred between the two teachings of the lessons?

P: I say a lot. I feel like we weren't very prepared the first time.

R: Um hm.

P: Just because we didn't know what to expect and um, we used basically all the same things in the second one. We just added...

R: Um hm.

P: more. Like, the very first time we did a video, the video was revised to introduce tornadoes and storms but we didn't really talk about it. We didn't like address, ok we are going to be talking about and we are going to show you this video. And we didn't say we want you to make observations. We just played it which I thought after it happened the first time like that's just kind of what's the point of this. So we addressed that more and we added in the, there's like a scale, an F scale..

R: Um hm.

P: Like, um, rating from 0-5 like how intense tornadoes are.

R: Um hm.

P: And so we added that in to just like have more time because we were worried about time and it just provided more material and stuff like that. So we added more, and I think like how we presented it was a lot better than the first time.

R: Okay, uh, do you have any other comments about lesson study? Anything that came up in the group or confusions or...

P: Um, I don't think so..

R: Um hm.

P: I think, I think, I think it worked really good. Maybe just like, um, the evaluations, we weren't really sure. We were a little confused on that.

R: There was a lot going on.

P: I understand. That really doesn't have anything to do with it so..

R: Okay, well alright! I appreciate it. Thank you!

P: You're welcome! Thank you!

Interview #4: Group D

R: Alright, so this is Catherine Scott, uh, how did you like the lesson study process?

P: I enjoyed it very much. I thought it was very valuable.

R: Okay, uh, what were some of the strengths that you saw in the lesson study?

P: Um, I really enjoyed the collaboration process, um, I think that's really important.

R: What about some of the weaknesses?

P: Uh, weaknesses....um, well I guess it would depend on personalities, you know?

R: (laughs)

P: And that's why when your grouping your children, as well, in the classroom, you're grouping them with people so they can work together, and it's the same with teachers. You would probably work well, better with some than you would others.

R: Right.

P: But you still, you know, you make that effort. We are all different. There are strengths that we bring to their ..(Another student interrupted to ask a question)

R: Okay, how do you feel that your group collaborated?

P: I, I thought we did really well.

R: Did you guys have, uh, meaningful discussions in which you kind of challenged each other and pushed each other, or did you all kind of agree generally with each another without really challenging?

P: Um, I think we just kind of, it was more of building on each other. We would throw out our ideas and then someone would say, hey that's a good idea, and they'd would build on it, maybe, what about this, you know that kind of thing. Um, like in the mis.... misconceptions, we were thinking, okay, what can we do with that? And then someone said how the kids think how the flowers drink, you know, through their petals. And then someone would say yeah, I used to water the leaves, thinking that's how, you know. So that's how we just kind of put it together like that.

R: Okay, great! Um, how well do you think you observed student learning and how your group observed it?

P: Um, I think we did well. We created rubric, rubrics in order to...

R: Awesome.

P: ... to observe the other group. We were taking notes on how they interacted.

R: What were some of the things that you all decided to observe?

P: Uh, we were observing the collaborative process, and the um....uh, the other one was....

R: critical thinking?

P: Critical thinking! Yes, critical thinking.

R: Okay, how much research, uh, did each of you contribute to the lesson?

P: Um, we all contributed but Susan, she actually, she wrote it up. She did the write up. She did the most. We all helped, but she did it.

R: Did you guys look at lessons that had already been formed completely? Or did you guys kind of piece meal the activities together from >

P: We pulled from all different areas and we pulled from our own experience.

R: Did you all, did you all make up a lot of it? Like the activities, did you come up with it on your own or did pretty much everything come from somewhere?

P: Um, I think we had all seen that done, where the color was drawn up through the, um, the plants, and I think Suzanne had actually done it as part of class. So having that experience, it was easier for her to write it up.

R: Okay.

P: I can't speak for her how she... We used other resources, but I think she pretty much wrote it up from experience.

R: Great, um, how much improvement occurred between the two teachings of the lesson?

P: Um, Kayla came up with a really, uh, she perceived, um, just in the way we had done it, the inquiry part needed to be more at the front, at the beginning, and the explanation part needed to be at the end.

R: Okay.

P: That's how we changed our lesson up in that regard.

R: Great.

P: Um, in other words, instead of reading the book first, which would have provided all the answers...

R: Right.

P: We put it to the back so...

R: So you all made it more inquiry rich. That's awesome! Um, what are some other comments you have regarding lesson study? Anything else?

P: I just thought it was excellent, and if I have an opportunity to engage in it again, I would really like to do that. I thought it was really, really good.

R: Okay, awesome. Well I appreciate it! Thanks!

P: Thanks! Appreciate you!

VITA

Elizabeth Ann Mitchell was born to Teresa and Mike Mitchell of Tupelo, Mississippi on May 16, 1985. She has one younger sister, Laura Mitchell. Elizabeth grew up in Mooreville, Mississippi. She graduated from Mooreville High School in 2003. She attended Itawamba Community College and then the University of Mississippi where she earned a Bachelor of Science degree in Secondary Science Education.

Elizabeth taught at Mooreville High School for two years following graduation. During that time, she earned a Master of Education in Curriculum and Instruction degree from the University of Mississippi. Elizabeth then entered the doctoral program at the University of Mississippi. During the Ph. D. program, Elizabeth taught a variety of courses for the Teacher Education Department. She also supervised student teachers and senior practicum students.

During the third year of the doctoral program, Elizabeth received a fellowship with the Center for Mathematics and Science Education. There she coordinated professional developments for in-service science teachers, facilitated science research seminars, and became familiar with current trends and research in mathematics and science education. Following the fellowship, Elizabeth received a job at Regents School of Oxford located in Oxford, Mississippi.

As a researcher, Elizabeth has investigated lecture teaching methods versus hands-on teaching methods in science education. Elizabeth used preservice teachers in a science methods course to investigate which teaching method was more effective and which yielded greater learning retention over the course of a semester.

Elizabeth served as the president of the Phi Delta Kappa chapter at the University of Mississippi. She was also a member of the Graduate Student Council at the University of Mississippi, where she served on the Student Affairs Committee. Elizabeth is also a member of several other professional organizations such as the National Science Teachers Association, Mississippi Science Teachers Association, Kappa Delta Pi, and others.

Elizabeth's research interests include integrating lesson study in the United States, science efficacy, and professional development methods. Additionally, she is interested in integrating science with the Common Core. Elizabeth has presented at numerous national and state conferences.

