

Learning and Applying Constructivist Approaches to Elementary Classrooms

HARUKA KONISHI

Missouri Western State University

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Abstract

Project Construct is a learner-centered constructivist framework that values positive teacher-student relationships, autonomy, and child-led experiences. Constructivists believe that learners actively construct their own knowledge rather than passively receive information. Prior research shows that constructivist approaches positively influence cognitive, behavioral, and academic outcomes (Lerikkanen et al., 2016). Despite the significance of constructivist approaches, education students tend to emphasize teacher-directed activities and behaviorist frameworks or approaches that shape behavior through external factors such as rewards. The present pilot study investigated whether the opportunity to learn and apply constructivist teaching approaches in an elementary school setting would affect education students' constructivist practices and beliefs. Eight education students participated in a four-week summer undergraduate class in a public-school setting. Students' comprehension of constructivist pedagogy was assessed through a 30-statement questionnaire. Results showed that Education students' knowledge of principles of constructivism grew significantly from the beginning to the end of this semester. Pre-service teachers also presented their experiences at a college wide undergraduate conference. Education students reported that such experiences were beneficial. These findings highlight the importance of applying constructivist practices in K-12 classrooms and benefits of pre-service teachers engaging in research in teacher education programs.

Introduction

Early childhood teacher education programs play an important role in forming preservice teachers' knowledge, beliefs, and practices (Darling-Hammond & Baratz-Snowden, 2007). Education students have their own beliefs, experiences, and misconceptions about teaching and learning. These beliefs tend to be traditional or behaviorist and are a result of students' experience with their own educational experiences (Holt-Reynolds, 1992). Yet, a large number of modern early childhood curricula draw on constructivist theory or, the idea that students construct their own knowledge through a variety of experiences, to conceptualize how children develop and are supported in the classroom (Murray, 2015). Constructivist theory also underlies developmentally appropriate practice created by the National Association for the Education of Young Children (NAEYC). Thus, it is essential for Education students to adopt more constructive beliefs and child-centered practices in early childhood education. To meet this shift in pedagogical beliefs and practices, Education students need to develop and employ constructivist instructional approaches during their preservice training. The present study examines whether application of constructivist practices affects pre-service teachers' knowledge of constructivist pedagogy.

Constructivism in Early Childhood: Project Construct

Constructivism has its origins from the philosophical underpinnings of cognitive theorists Piaget and Vygotsky (Bredenkamp, 1994). Constructivist educators work under the assumption that children are actively creating their own meaning and knowledge by exploring and experimenting with materials and people (DeVries & Kohlberg, 1990). The role of the teacher is to scaffold and serve as a guide based on children's interests. Research shows that child-centered curricula and constructivist pedagogical approaches and beliefs that emphasize positive relationships, child-led experiences, and adaptation to individual differences, are associated with positive cognitive and behavioral outcomes (Cornelius-White, 2007; Lerkkanen et al., 2016). Additionally, studies have found that constructivist practices engage student interest, active exploration and experimentation, and promotes cooperation (DeVries & Zan, 1994).

Project Construct is a learner-centered constructivist framework that is approved by the Missouri Department of Elementary and Secondary Education that encourages children to acquire knowledge through interactions with the environment (Schatzgen, 1997). Project Construct is influenced by the work of Piagetian scholars (DeVries & Kohlberg, 1990), constructivist educators (Ray, 2002), and best practices in early childhood education (Katz, 1988). The Project Construct framework is guided by four principles of child development and related practices: 1) children have an intrinsic desire to make sense of the world, 2) children actively construct knowledge and values based on the physical and social world, 3) in their struggle to understand the world, young children's

thinking will contain predictable developmental errors, 4) another focus of the Project Construct approach is for teachers foster the development of each child as an autonomous individual. Additionally, Project Construct highlights the idea that children learn best and make better choices within a context of positive relationships with adults and peers. Research supports the effectiveness of Project Construct (Pfannenstiel & Schattgen, 1997), as children who were in classrooms that endorsed Project Construct displayed benefits relative to business-as-usual classrooms. Despite the impact of constructivist beliefs and practices on child development, novice teachers and education students tend to rely on behaviorist approaches that are teacher centered and are heavy on direct instruction (Applefield et al., 2000).

Pedagogical Beliefs and Teacher Education Programs

Pedagogical beliefs are important indicators of whether pre-service teachers engage in specific practices (Handal & Herrington, 2003; Karchmer-Klein & Konishi, 2021). Research on pre-service teachers suggest that perceived importance of a pedagogical approach was a significant predictor of whether they engaged in that particular pedagogical practice (Karchmer-Klein & Konishi, 2021). Early childhood teachers' beliefs are among the key predictors of their classroom behaviors and practices (Buchanan et al., 1998; Vartuli, 1999). Teachers' beliefs shape their thinking and behavior in the classroom (Rimm-Kaufman et al., 2007). Although other factors, such as teachers' self-efficacy, parents' and administrators' expectations, and classroom size, also contribute to teachers' classroom practices (Buchanan et al, 1998; McMullen, 2001).

Research on early childhood teacher education programs revealed that students who are further along in the program hold more developmentally appropriate beliefs and child-centered views than do students who are either not enrolled in a teacher preparation program or who are just beginning the program (Scott-Little, La Paro, & Weisner, 2006). Studies that have shown positive shifts in constructivist beliefs among student teachers can be characterized as providing concrete constructivist teaching skills and scaffolding strategies (Baik & Charlesworth, 2006) and exposing preservice teachers to course content that describes constructivist teaching principles (Scott-Little, La Paro, & Weisner, 2006). This shows that exposure to concrete constructivist teaching practices and principles affect preservice teachers' knowledge of constructivism. Another approach that has shown to be effective is for preservice teachers to *observe* constructivist instructional strategies in both university and early childhood classrooms (Lim & Chan, 2007; Scott-Little, La Paro, & Weisner, 2006). The literature on whether *applying* constructivist practices in university and early childhood classrooms can facilitate constructivist practices and beliefs is limited. Constructivism can also be further promoted through involvement in research. Indeed, the scientific method starts with an authentic question and follows a process of inquiry which are essential elements of constructivist practices.

Recent research has shown benefits in pre-service teacher research in various countries (e.g., Aspfors & Eklund 2017; Cochran-Smith et al. 2009). Inquiry is a natural process of assessment which is also an integral part of evaluating learning and being an effective teacher. Further, using inquiry can help pre-service teachers and teachers become more cognizant of the scientific literature that support their practice (Darling-Hammond et al., 2017). However, the literature on pre-service research has focused primarily on master's degree programs; less is known about pre-service teacher research in bachelor programs (Munthe & Rogne, 2015). The process of presenting at an undergraduate research conference may boost Education students' conceptualization of constructivism as research and constructivism go hand and hand.

Investigating how constructivist beliefs and practices become valued by teachers is an important area of research, given the efficacy of constructivist pedagogy on student outcomes. A study compared constructivist versus non-constructivist teaching beliefs and practices by distributing questionnaires to non-constructivist and constructivist teachers. Findings showed that children from constructivist classrooms performed better on tests of writing, reading, math and language, suggesting that constructivist practices facilitate academic achievement (Pfannenstiel & Schattgen, 1997).

Despite the importance of constructivism, early childhood teachers find it difficult to implement constructivist pedagogy in the classroom, due to the structural constraints of the school, standards and curricula, and pressures of standardized assessments (Buchs et al., 2017). There are various competing factors that get in the way of implementing constructivist practices. The need to explore how pre-service teachers adopt constructivist practices is critical, as misalignment in pedagogical beliefs between the teacher and the school can have negative consequences on children's social emotional development and teacher retention (Buehl & Beck, 2015).

Present Study

The present pilot study investigated whether learning and applying constructivist teaching approaches in an elementary school setting would affect pre-service teachers' knowledge of constructivism. Education students participated in a four-week summer undergraduate class in a public-school setting. Education students' knowledge of constructivist principles was assessed via a survey before and after the four-week undergraduate course. Education students were also given the choice to present their implemented constructivist lesson plan at an university wide undergraduate conference. The conference presentation is another layer of application that has the potential to deepen student knowledge of constructivism, as students must present and explain constructivist pedagogy to conference attendees who are unfamiliar with constructivism.

Methods

Preservice Teachers

Eight female early childhood pre-service teachers participated in a four-week course that incorporated the core principles and practices of Project Construct in a public school classroom setting. Half of the students chose to present at a university wide undergraduate conference at Missouri Western State University when given the opportunity to do so. We did not require students to present at the conference because the conference took place several months after the summer class and because giving students choices is a constructivist practice. These participants were predominantly white and female; their average age was 21.4 years old.

Facilitator of Project Construct

A trained facilitator of Project Construct taught the four-week summer course. She has over 20 years of experience as a public school teacher and has done Project Construct training and workshops for over 10 years.

Project Construct Class for Pre-Service Teachers

This was an undergraduate four-week class which met four times a week for three hours per day. This course occurred in an elementary school where summer programming was taking place (Figure 1). Each student was allowed to pick the grade level of their choice but were randomly assigned to an elementary school classroom. The first hour and a half of the class involved the pre-service teachers learning about constructivism through lecture, discussion, and activities. Pre-service teachers read the Project Construct framework textbook and other articles on constructivism (Missouri Department of Elementary and Secondary Education, 2013) to learn about Project Construct and constructivism. The second half of the class was focused on observing and applying concepts, strategies, and lesson plans to children in the classroom. The course consisted of reading and having discussions about constructivism, the instructor modeling constructivist strategies and pre-service teachers experiencing constructivist practices, observing and implementing constructivist practices in K-12 classrooms by the pre-service teachers.

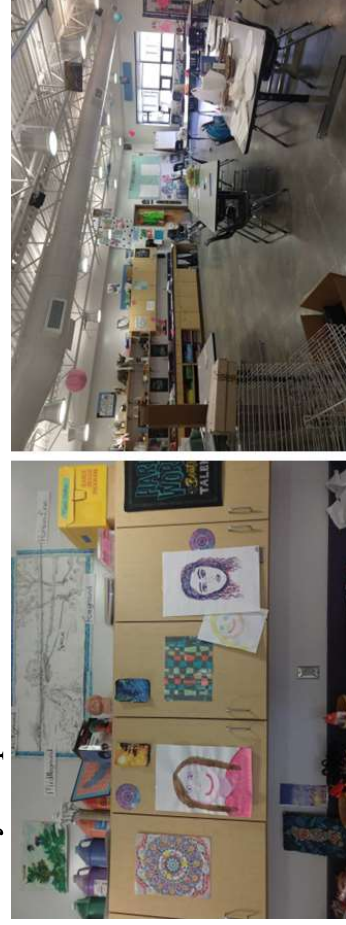


Figure 1. Artwork that education students created and the classroom that students took the 4-week class in.

Pre-service teachers learned about foundational beliefs about constructivism which states that learning is a dynamic process of creating meaning from experiences where students learn to make sense of the world through application with the teacher as a facilitator to scaffold their learning and offering choices along the way. Co-construction of knowledge was emphasized in the course through discussions and working collaboratively on lesson plans and assignments. Education students were given ample opportunity to discuss what constructivism is and is not in groups. Pre-service teachers were also asked many open-ended questions about the nature of constructivism to probe their critical thinking skills. Pedagogical practices that are consistent with constructivism were modeled in the course that the pre-service teachers experienced and were explicitly labeled as constructivist practices. For example, students engaged in community building activities as a way to build positive relationships between students and faculty. Another example was when students were given a say in creating classroom norms and the structure of assignments.

After having learned about constructivism through readings and classroom discussion, pre-service teachers spent every class observing children in classrooms. Such observations allowed students to identify which practices were consistent or inconsistent with constructivism. For example, kindergartners were given at least 30 minutes of open-ended center time to engage in experiences of their choice (e.g., building towers in the block area) at the school that they were in. This practice is consistent with Project Construct, as children are given time to explore their environment and materials freely. Pre-service teachers also observed children receive extrinsic rewards and punishment through the use of behavior charts and discussed how this approach does not align with a constructivist framework. The idea of punishing unwanted behavior is more in line with behaviorist approaches. Education students had opportunities to observe and reflect on examples as well as non-examples of constructivist teaching practices. These observations often led to discussion of misconceptions about constructivist practices. An existing misconception was that constructivist classrooms are a free-for-all. Instead, education students learned that although children are afforded the opportunity to make autonomous decisions and use critical thinking, there are boundaries that will be held which are often associated with safety.

Finally, pre-service teachers had opportunities to apply constructivist practices in K-12 classrooms with children. For example, pre-service teachers created an art integration lesson plan and implemented it in the kindergarten classroom. Although there were restrictions about the learning standard that pre-service teachers used in their lesson plan and incorporating constructivist pedagogy, they were free to design an art integration lesson plan of their choice. In sum, the course involved reading and having discussions about constructivism, modeling and experiencing constructivist practice, observing and implementing constructivist practices in K-12 classrooms. The question was whether these approaches would create a shift in pre-service teachers' thinking

about constructivism. To measure Education students' knowledge of constructivism, students were asked to fill out a questionnaire at the beginning and end of the four-week course.

Measures

Project Construct Survey

A survey that captures the core principles and practices of Project Construct was developed. The survey contained 30 statements that examined students' knowledge of Project Construct principles. Most of the items on the survey were sampled from the Project Construct Early Childhood Classroom Observation Scale (PC-ECCOS) which has reliability and validity. The PC-ECCOS Students were asked to rate the extent to which Project Construct teachers should engage in the following practices on a one (Agree) to five scale (Disagree). The following are some of the statements on the survey: Teachers should focus on isolated skills without context to teach conventional knowledge, children should be encouraged to develop logical thinking through everyday experiences, teachers should ask children open-ended questions to facilitate child involvement and understanding. All students filled out the survey before and after the four-week class.

Presented at the Multidisciplinary Research Presentation

All Education students were invited to present a poster of the art integration lesson that they implemented at a university wide undergraduate conference at Missouri Western State University. Students received support and scaffolding from faculty but they were given the choice to present, to present on a topic of their choice, and to choose to work as a group. These pedagogical decisions are in line with constructivism. Four Education students chose to collaborate and present one poster at the undergraduate research conference. Their posters met criteria determined by the instructor. First, the topic has to involve constructivist practices. Second, posters must express the importance of the topic. Finally, students had to demonstrate their findings using authentic assessment.

Results

Pre-Service Teachers' Knowledge of Project Construct

A paired-samples t-test revealed that preservice teachers' overall knowledge of principles of Project Construct grew significantly from the beginning ($M=121$, $SD=8.84$) to the end of this four-week period ($M=125.75$, $SD=8.64$), $t(7) = -2.378$, $p = .04$. In particular, there was significant growth in items that described the importance of allowing children to contribute to classroom discussions and read alouds $t(7)=2.346$, $p=.05$, and the importance of teachers' modeling metacognition or their thinking process out loud $t(7)=2.646$, $p=.03$ (Figure 2). Kurtosis was within the acceptable range of -1 to 1, which suggests an approximately normal distribution of the data.

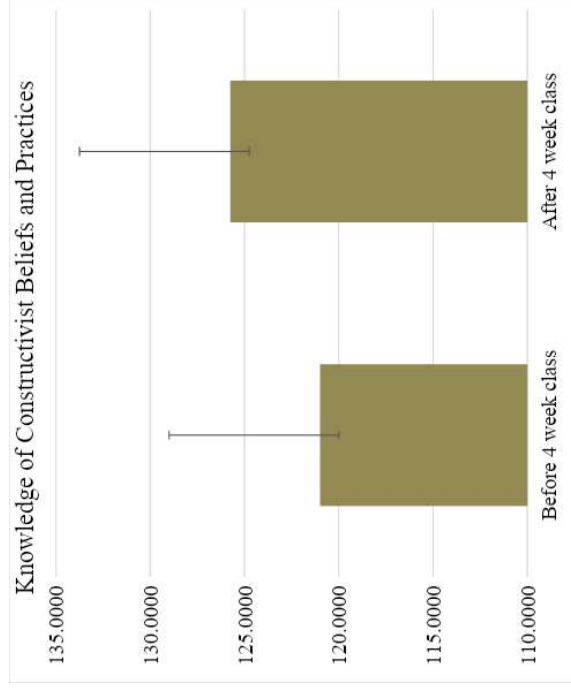


Figure 2. Education student’s knowledge of constructivist beliefs and practices before and after the 4-week class.

Pre-Service Teachers’ Lesson Plan Implementation

Education students explored whether writing and implementing an art integration lesson plan with a constructivist view with elementary school students might affect children’s creativity and critical thinking skills in K-12 classrooms. The lesson plan consisted of pre-service teachers reading a book and offering an open-ended art experience with a variety of open-ended materials. For example, some education students read a story and children were asked to create a piece of artwork that represented the main message of the story. Education students took anecdotal notes on what children (N=18) said during the lesson and photographs of children’s work as a part of their assessment. This authentic assessment approach is considered best practice in the field of early childhood.

Indications that children have shown creativity and critical thinking skills include the ability to take the artwork in an unexpected direction, using rich vocabulary to describe their work, employing agency to make their own decisions and display flexibility (Figure 3). A first grader displayed creativity and imagination when they said, “I put the toothpaste in the play dough to make it smell like toothpaste. So the tooth fairy will fly in and get trapped.” Children also used rich vocabulary to display their mathematical knowledge by using math vocabulary, “We build our robot out of spheres. The hat is a cube.” These qualitative data taken by Education students showed that children used materials in a variety of ways and used rich vocabulary that demonstrates critical thinking and understanding of a variety of mathematical concepts.

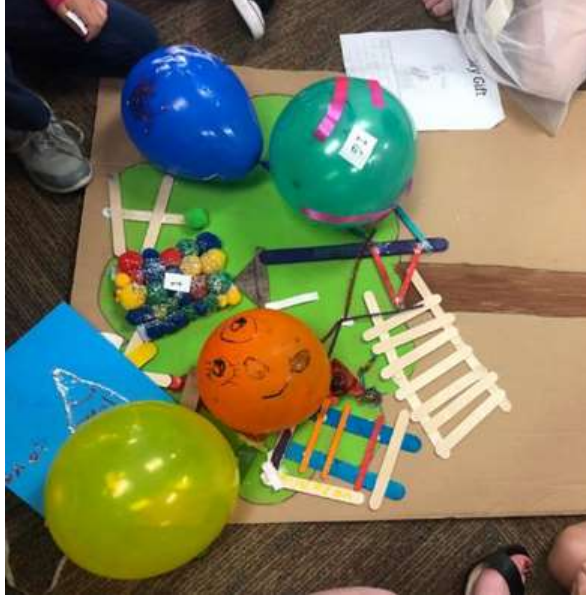


Figure 3. Artwork that elementary school students created as part of the lesson plan that the pre-service teachers implemented.

Pre-Service Teachers' Presentation at an Undergraduate Conference

Education students were offered the choice to participate in a poster presentation at a university-wide undergraduate conference at Missouri Western State University. The poster summarized the art integration lessons that four Education students implemented with first and third grade students. Students received significant support and scaffolding from the instructor to prepare for the poster presentation. We debriefed with education students after the research conference. Students commented that they appreciated the opportunity to share their work with other students, exposure to other research presentations and learning about how conferences work (Figure 4).

How does integrating arts foster critical thinking in the classroom?

Halle Koelliker, Taryn Gibson, Alicia Constant, & Alexis Swearingin
School of Education
Ronda Chesney & Haruka Konishi

<p>INTRODUCTION</p> <p>Children in Elementary schools are commonly not given many choices or the opportunity to show creativity. In Summer 2019, four Missouri Western college students spent time observing and teaching in elementary school classrooms.</p> <p>Goal: Investigate if integrating arts into content area deepens critical thinking and creativity in the classroom.</p>	
<p>METHOD</p> <p>The preservice teachers created individual original lessons for core subjects with various types of art</p> <ul style="list-style-type: none"> The art included movement, music, and visual art featuring clay, glue, and paper. When one teacher worked with the art included a read-aloud, science lesson, and math lessons. <p>Authentic assessments of the lessons along with quotes were used to examine children's thinking</p>	<p>QUOTES</p> <p>1st grader: "I put the toothpaste in the play dough to make it smell like toothpaste. So the tooth fairy will fly in and get trapped."</p> <p>1st grader: "We built our robot out of a sphere. The hat is a cube."</p> <p>3rd grader: "I was making an animal with my clay but it looked like a turtle instead, so now it's a turtle."</p>
<p>CONSTRUCTIVISM and ART INTEGRATION</p> <p>When children have a say in what materials they want to use and choice in what they want to say instead of relying on worksheets</p> <ul style="list-style-type: none"> Children will take the activity in unexpected directions Children will use higher level vocabulary Children will demonstrate autonomy and flexibility <p>The preservice teachers used new vocabulary and open-ended questions to foster children's thinking</p> <ul style="list-style-type: none"> Examples of vocabulary words were sculpture, prediction, traits 	<p>CONCLUSION</p> <p>Based on the data gathered through authentic assessments, children showed the ability to verbalize the critical thinking that they gained through the art that they created.</p> <ul style="list-style-type: none"> Children had rich discussion about the art experience in ways that were beyond above and beyond expectation, demonstrating critical thinking and creativity Children used a range of rich vocabulary

Figure 4. A poster that pre-service teachers presented at the Multi-Disciplinary Research Day.

Discussion

Shift in Constructivist Practices and Beliefs in Pre-service Teachers

The present pilot study found that Education students made significant shifts in their knowledge of constructivist practices and beliefs over a four-week period. These findings are consistent with prior studies that have found that intervention courses designed to change pedagogical beliefs have promoted constructivist beliefs among student teachers (DiPietro, 2004). Results of the present study are unsurprising given that the four-week course incorporated a variety of factors that were found to be helpful in boosting education students' beliefs in prior work. Lee, Baik, and Charlesworth (2006) showed that explicitly incorporating concrete teaching skills and scaffolding strategies resulted in positive shifts in teacher beliefs. Like past studies, the present study explicitly discussed constructivist principles, beliefs, and practices (Scott-Little, La Paro, & Weisner, 2006). Additionally, similar to prior studies, the present study not only allowed pre-service teachers to observe constructivist practices in both university and early childhood classrooms, they also got to implement those practices with children in classrooms. The results of the present study could be attributed to the combination of these effective strategies and the added layer of the opportunity to apply constructivist practices.

The opportunity to apply constructivist pedagogy with young children in the classroom may have had an effect on Education students' knowledge of constructivism. Education students spent every class period interacting with children in classrooms and engaging in a variety of community building activities with them. Education students implemented an art integration lesson plan in the classroom that they spent time in. This art integration lesson plan involved a constructivist framework, as children were given the agency to make choices. The autonomy element is evident in the art component of the lesson, as children could use any materials to create a visual representation of the story. The positive relationship that Education students had built with the children and the process and choice-based nature of the art lesson allowed children to successfully represent and articulate the main message of the story. Engaging in constructivist practices, allows students to experience the benefits of those evidenced based approaches. Furthermore, growth in student knowledge of constructivism could have occurred due to the alignment in beliefs between the instructor and the practices that the instructor and the education students engaged in. Because teaching does not occur devoid of context, when there is congruence in belief systems, the likelihood of a shift in pedagogical beliefs and practice is greater (Buehl & Beck, 2015).

Presenting at an Undergraduate Conference

Education students presented at an undergraduate research conference. Students reported positive impressions of the conference and the experience. Prior research has shown that when students presented at undergraduate research

conferences, they suggested that the experience was relevant and in alignment with their education and career goals (Helm & Bailey, 2013). Students also reported greater long-term self-efficacy and motivation to learn about the profession (Helm & Bailey, 2013). Additionally, the Council for Accreditation of Educator Preparation (CAEP) has a standard that states, “Providers ensure that completers use research and evidence to develop an understanding of the teaching profession and use both measure their P-12 students’ progress and their own professional practice.” This supports the idea that teacher candidates should have opportunities to develop the various skills that are involved in conducting research and accessing research-based practices.

The presentation at the conference is not the only benefit of participating in a conference. The process of preparing for the poster presentation with the help of a mentor is equally impactful. Education students in the present study received significant mentoring throughout this experience. Mentoring or the process in which a mentee receives guidance, modeling, and encouragement to enhance their professional growth and development has been shown to lead to greater sense of connectedness and persistence through teacher education programs (Cokley, 2000). Working closely with a faculty member can sustain life-long human and intellectual connections with students in the quest of knowledge and lifelong learning (Legget, 2003). These values align closely with constructivist approaches, as positive relationships serve as the foundation for learning.

Additionally, exposure to undergraduate research helps education students experience the process of inquiry which is consistent with constructivist approaches. Students were given the opportunity to generate an authentic question. The instructor then helped students find and evaluate supporting research articles to learn more about the topic of interest. This process allowed students to learn more about educational issues and how to evaluate existing research for validity. Students were also given scaffolding when pursuing their question. The instructor and students discussed a variety of topics related to the lesson plan that would address the specific question such as choice of materials and how to authentically collect data. Education students then implemented the lesson, collected qualitative data, and created a poster for the conference. These experiences encourage students to apply knowledge and to problem solve with the help of a mentor. Prior research shows that education students develop critical thinking, problem solving, and communication skills by participating in research conferences (Kinkel & Henke, 2006). Our education students also reported that they appreciated learning about how conferences function, having exposure to research presentations and having opportunities to interact with other students from other disciplines. Overall, involving education students in undergraduate research is beneficial, as it encompasses inquiry that addresses a specific question, application of applied research methodology, and resulting in dissemination of findings (Merkel, 2003).

Limitations

The present study yielded findings that have implications for the field of teacher education. However, it is important to acknowledge a few limitations of the study. The study had a small sample size which can undermine the validity of the findings. The plan is to collect additional data in the future. Second, although the items from the questionnaire that we developed were from an established assessment (i.e., PC-ECCOS), we did not have sufficient data to run statistical analysis to establish validity or reliability. Future work will collect more data so that validity and reliability of the questionnaire can be fully investigated.

Implications for Future Practice

There are specific constructivist practices that can be gleaned from the present study as well as extant literature. Future courses focused on promoting constructivism should be developed with the following key principles and practices:

1. *Develop positive relationships with students by getting to know them, allowing them to learn about you as a person and engaging in community building activities.* The instructor should make an effort to learn and say the names of students and learn about their interests and preferences. Similarly, the instructor should share personal information about themselves that might be relevant to the class.
2. *Students are encouraged to be autonomous and make decisions in class and about the class.* For example, students should have a say in developing some norms of the class at the beginning of the semester (e.g., use of cell phones). When students contribute to the development of classroom norms they are likely to keep them.
3. *Build on student responses when making on the spot decisions about instructional strategies, activities, and content to be taught.* For example, if students become interested in a particular topic in class, they may be given the opportunity to pursue it even if it deviates from initial plans. Students may also be given the choice to choose between assignments or may contribute to creating their own assignment with appropriate parameters.
4. *Assess student prior knowledge about a concept before teaching it to them.* When students are evaluated on their prior knowledge, this allows for instructors to tailor the delivery of the content and address possible misconceptions.
5. *Model best practice and be explicit about when the instructor is modeling constructivist practices.* The instructor may implement a constructivist lesson plan with education students that they would engage in with children.
6. *Encourage student critical thinking by asking open-ended questions, providing ample opportunities for discussion and collaborative group*

- projects.* After students have done the reading, students should have an opportunity to have an open discussion about examples and non-examples of constructivist practices. Education students should be given the option to work collaboratively on group projects.
7. *Give students a long wait time after posing a question so that students have time to think about their answers and be able to respond thoughtfully.* Education students need sufficient time to explore newly acquired knowledge and to respond in meaningful ways.
 8. *Have students observe examples of concepts or pedagogical practices in K-12 settings.* Students should be taken to K-12 classrooms to make observations about relevant constructivist practices and non-constructivist practices.
 9. *Offer students the opportunity to interact with children and apply constructivist practices.* Students should be offered scaffolded opportunities to implement lesson plans.
 10. *Preparing and presenting at conferences with the help of a mentor is beneficial for students.* With the help of a mentor, education students should have the opportunity to present their work through a process of inquiry in a professional setting.

Conclusion

Prior work has shown that explicitly seeing constructivist pedagogy in university and K-12 settings can promote comprehension of constructivism. The present study contributed to the literature by showing that *experiencing* and *applying* constructivist practices helps deepen pre-service teachers' knowledge of constructivism. All Education students implemented a lesson plan with a constructivist framework and collected authentic assessment data. The qualitative data showed that children engaged in creative thinking and used complex language to demonstrate their knowledge. Pre-service teachers who chose to present their constructivist lesson plan at a university wide conference, reported that they valued the opportunity to share their work. Overall, this work suggests that a four-week course in a K-12 setting can move future teachers' knowledge of constructivism, highlighting the importance of application in teacher education programs