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How constructivism influences pre-service teachers' beliefs and practices and child self-regulation

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ABSTRACT

Project Construct is a learner-centered constructivist framework that emphasizes positive teacher-student relationships, autonomy, and child-led experiences. Constructivist pedagogy promote cognitive, behavioral, and academic outcomes. Yet, novice teachers struggle to grasp constructivist teaching practices and tend to emphasize teacher-directed activities. The present study investigated whether the opportunity to learn and apply constructivist teaching approaches in an elementary school setting would affect education students' understanding of constructivism and children's self-regulation. Eight education students participated in a 4-week summer undergraduate class in a public-school setting. Students' understanding of constructivist principles was assessed through a 30-statement questionnaire. Kindergarten classrooms were randomly assigned to either the Project Construct classroom where Education students participated in or the control classroom. Children's self-regulation skills were assessed through the Head Toes Knees and Shoulders (HTKS) Task before and after the 4-week class. Results revealed that Education students' knowledge of principles of constructivism grew significantly from the beginning to the end of this semester. Children's performance on the HTKS grew significantly in the Project Construct and control classrooms, although there were no significant differences between the Project Construct and control classroom. These findings have implications for teacher education and how constructivist pedagogy can affect child self-regulation.
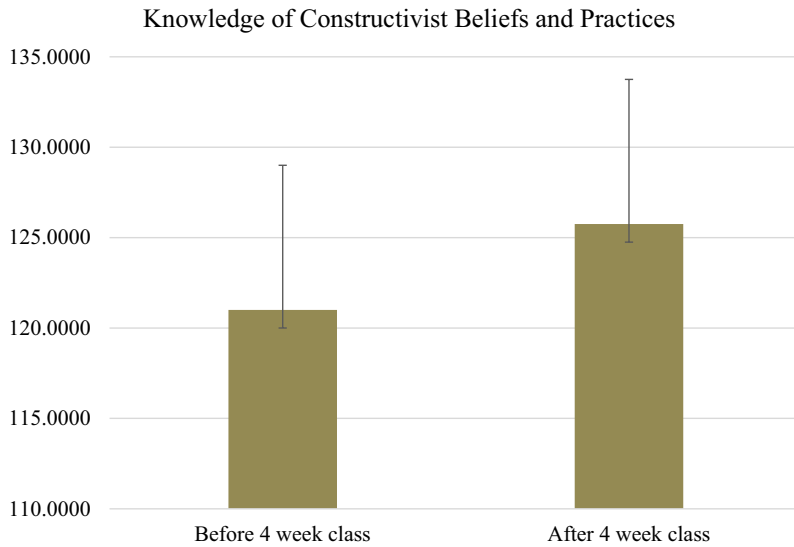
A variety of early childhood curricula draw on constructivist theory to conceptualize how children develop and are supported in the classroom (Murray, 2015). Foundational values underlying developmentally appropriate practice created by the National Association for the Education of Young Children (NAYEC) and other emergent curricula originate from constructivist theorists such as Piaget and Vygotsky. Constructivist theory and early childhood as a field highlight the importance of children's ownership and agency in the learning process. Learning opportunities are guided by children's interests, needs, and abilities while also incorporating early learning standards (Cassidy et al., 2003).

Research shows that child-centered curricula that emphasize positive relationships, child-led experiences, adaptation to individual differences, and constructive teacher beliefs are associated with positive cognitive and behavioral outcomes (Cornelius-White, 2007). In contrast, teacher-directed practices have shown to negatively impact children's reading skills

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Knowledge of Constructivist Beliefs and Practices

Figure 1. Education students' knowledge of constructivist beliefs and practices before and after the 4 week class.

Children's Self-Regulation Skills
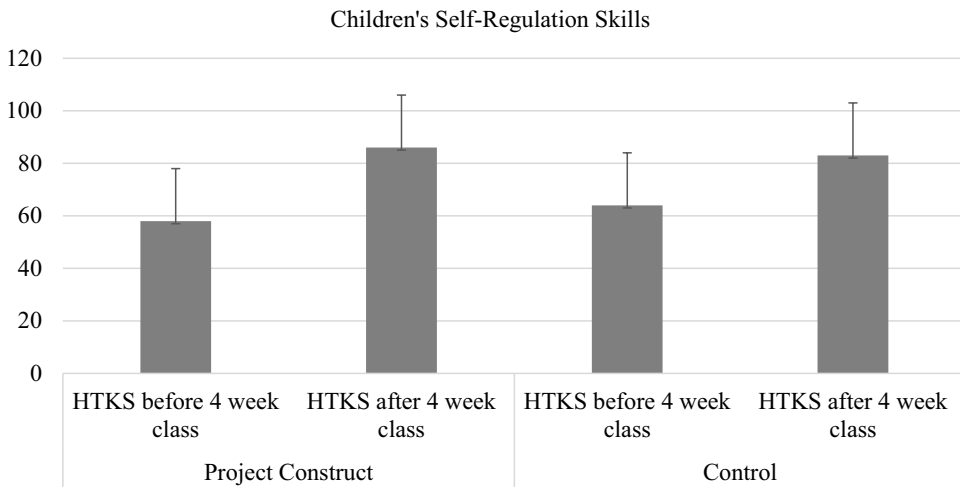
Figure 2. Children's HTKS scores before and after the 4 week class.

(Lerkkanen et al., 2016). Such research supports the importance of organizing curricula around child-led practices in fostering positive child outcomes.

Project Construct curriculum

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 physical and social environment (Schattgen, 1997). This framework is influenced by the work of Piagetian scholars

Table 1. Education students' knowledge of constructivist beliefs and practices before and after the 4 week class.

Teacher candidate	Pre-test: Knowledge of constructivist beliefs and practices scores	Post-test: Knowledge of constructivist beliefs and practices scores
Teacher Candidate 1: Placed in PC Classroom	124	130
Teacher Candidate 2	127	126
Teacher Candidate 3	106	130
Teacher Candidate 4	127	115
Teacher Candidate 5	120	137
Teacher Candidate 6	115	117
Teacher Candidate 7	115	117
Teacher Candidate 8	134	136

Table 2. Mean and standard deviation of education students' knowledge of constructivist beliefs and child self-regulation scores.

Scores	Mean (SD)
Pre-Test: Knowledge of Constructivist Beliefs and Practices Scores	121(8.84)
Post-Test: Knowledge of Constructivist Beliefs and Practices Scores	125.75(8.64)
Pre-Test: Children's Self-Regulation Scores For Control Classroom	58(24.28)
Post-Test: Children's Self-Regulation Scores For Control Classroom	86.2(15.96)
Post-Test: Children's Self-Regulation Scores For Project Construct Classroom	64.5(29.21)
Post-Test: Children's Self-Regulation Scores For Project Construct Classroom	83(23.73)

(DeVries & Kohlberg, 1990), constructivist educators (Ray, 2002), and best practices in early childhood education (Katz, 1988). The Project Construct framework is based on 4 guiding 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) Children's thinking will contain predictable errors.
4) Children's autonomy should be fostered through the support of teachers.

Autonomy or the ability to make choices, evaluate the best approach, and consider all relevant factors independent of rewards and punishments is a defining feature of Project Construct (Schattgen, 1997). Children in Project Construct classrooms are given the agency to freely explore, investigate open-ended materials, hypothesize and pose questions, investigate and defend ideas. Additionally, Project Construct emphasizes the idea that children learn best within a context of positive relationships with adults and peers. This is realized through a variety of community building experiences. The goal is to build mutual trust with the teacher and peers and cooperate and collaborate as a member of the learning community.

Efficacy of constructivist approaches on academic achievement

Quality of early childhood education can have significant impacts on child development. A longitudinal study investigated the effect of the quality of children's preschool experiences on child outcomes through second grade (Peisner-Feinberg et al., 2001). Results

showed that child-care quality had a long-term positive effect on children's cognitive and social development especially for children from more at-risk backgrounds. Research supports the efficacy of Project Construct (Pfannenstiel & Schattgen, 1997), as children who were in classrooms that endorsed Project Construct displayed benefits relative to business-as-usual classrooms. Constructivist approaches and beliefs have been shown to promote cognitive, social-emotional, and academic outcomes (Lerkkanen et al., 2016). Another study examined constructivist versus non-constructivist teaching beliefs and practices through distributing questionnaires to non-constructivist and constructivist teachers (Pfannenstiel & Schattgen, 1997). The traditional teachers were more likely to use worksheets and flashcards and to use rewards as extrinsic motivators rather than fostering intrinsic motivation to learn. Students in both types of classrooms participated in standardized batteries. Results from the study 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).

Recent research also supports the benefits of play-based curricula that incorporate elements of constructivism. Play-based curricula include constructivist approaches, as it encourages children to make choices and follow their own interests. A study examined the effects of a play-based curriculum on low-income kindergartners and found greater gains in receptive vocabulary as measured by the Peabody Picture Vocabulary Test 4th Edition (PPVT-4) and literacy learning in classrooms that incorporated play compared to a classroom with mostly direct instruction (Allee-Herndon et al., 2022). A meta-analysis of 39 studies published between 1977 and 2020 compared the effects of guided play, direct instruction, and free play on children's learning and development. The findings suggest that instruction that incorporates guided play is more beneficial than direct instruction for early math, shape knowledge, and task switching (Skene et al., 2022). Research also supports the efficacy of similarly constructivist curriculum like Reggio Emilia. The study examined how adults who have attended Reggio programs versus those who did not attend formal child care affected later outcomes. Relative to not receiving formal care, the Reggio Approach significantly boosted outcomes related to employment, socio-emotional skills, high school graduation, election participation, and obesity (Heckman et al., 2018). Finally, another study examined how an inquiry based science curriculum affected science knowledge, problem solving skills, and motivation. Results showed that children who experienced the inquiry based curriculum showed greater gains in physical science knowledge, problem-solving skills, and competence motivation as compared to those in the control group (Lin et al., 2021). In sum, a number of studies support constructivist curricular approaches and have shown benefits in a variety of academic outcomes, increased engagement, social interaction, critical thinking skills, and long-term life outcomes.

Pedagogical approaches that support child self-regulation

Less is known about the intersection of constructivist practices and child self-regulation or the ability to regulate behaviors, thoughts, and emotions (Schunk & Zimmerman, 1997). The present study focuses on behavioral self-regulation which closely aligns with executive function and can involve working memory, inhibitory control, and cognitive flexibility (McClelland et al., 2007). A number of studies have shown that self-regulation

in early childhood predicts concurrent and long-term math and literacy achievement (Duckworth & Seligman, 2005; McClelland et al., 2010).

Research has shown that the complex interaction of biology and experience determine the development of self-regulation (McClelland et al., 2010). Early experience and social interaction in which caregivers and other individuals scaffold and support children's trajectories appear to be key for self-regulation (Grolnick & Farkas, 2002). Although the development of social emotional skills is a multifaceted and complex process, positive emotional expressivity, sensitive and contingent responses are shown to support children's ability to self-regulate (Brophy-Herb et al., 2011; Lunkenheimer et al., 2013).

A quasi-experiment examined the effects of Responsive Classroom (RC) Approach, which is an intervention aimed at creating a sense of community, establishing rules and consequences, and minimizing problem behaviors (Elliott, 1995). The study found that children in RC classrooms showed better social skills and decreased problem behaviors relative to children in the control classroom (Rimm-Kaufman & Chiu, 2007). Similarly, a Vygotskian, classroom-based curriculum called Tools of the Mind, has shown to enhance children's self-regulation and academic achievement through classroom activities relative to children with no experience with the curriculum (Diamond et al., 2007). On the other hand, a meta analysis examining the efficacy of self-regulation interventions have found that although a majority of interventions have shown positive effects, a few have shown no effects on academic outcomes (Pandey et al., 2018). These studies show that self-regulation skills can be malleable through classroom experiences and varying teaching approaches. However, identifying the degrees of experiences and whether constructivist approaches support self-regulation are key next steps.

Teacher education and child self-regulation from a constructivist perspective

An underdeveloped area of research is how pre-service teachers and teacher education can play a role in supporting young children's self-regulation especially from a constructivist perspective. This is an important area to consider as one of the biggest challenges of novice teachers is supporting children's behaviors in the classroom (Tait, 2008). Research shows that pedagogical approaches that are heavy on punishment and rewards have negative effects on children's behaviors (Deci et al., 1999; Zubizarreta et al., 2019). In contrast, constructivist practices that offer children choices and autonomy are more effective in supporting children's behaviors (Cole et al., 2009). Yet, Education students tend to rely on punishment and reward-based approaches that they have experience with as students themselves and struggle to grasp constructivist pedagogy (Applefield et al., 2000). Education students also often have misconceptions about constructivism that affect their acceptance of constructivist approaches. For example, Education students perceive constructivist approaches to be a free-for-all where children can do whatever they want without any boundaries. Because struggles with classroom behaviors and management can affect the longevity of a teacher's career and children's development (Buehl & Beck, 2015; La Paro et al., 2009), there is a need to uncover whether constructivist practices can support pre-service teachers and children's self-regulation.

During teacher training, pre-service teachers must construct their own understanding of how children develop and the role that teachers play in this process. Such pedagogical beliefs serve as the foundation for what practices and curricula

pre-service teachers engage in. Pedagogy and practices not only influence one another in a reciprocal manner but they are affected by the pre-service teachers' knowledge, experiences, and the structural elements of the classroom, school culture, availability of resources and more (Buehl & Beck, 2015). Endorsement of constructivist approaches appears more likely to occur with early childhood specific training than not (File & Gullo, 2002). However, there is some research that shows that constructivist practices fade across preschool to third grade (Vartuli, 1999). That is as grade levels go up, practices become more teacher led. Furthermore, even when there is endorsement of constructivist practices and pedagogical beliefs, early childhood teachers find it difficult to implement them in the classroom, due to the structural constraints of the school, standards and curricula (Buchs et al., 2017). Early elementary grades are subject to increased pressure from administrators and parents to ensure children are prepared for standardized assessments (Buehl & Beck, 2015). Engaging in practices that are not aligned with one's pedagogical belief system can have negative consequences for teacher retention and children's social emotional development (Buehl & Beck, 2015), making the need to uncover how pre-service teachers' knowledge of constructivism may shift and affect the children they interact with a pressing one.

Present study

The present study investigated whether the opportunity to learn and apply constructivist teaching approaches in an elementary school setting would affect pre-service teachers' understanding of constructivism and children's self-regulation. Education students participated in a 4-week summer undergraduate class in a public-school setting. Education students' understanding of constructivist principles was assessed via a survey. The self-regulation skills of kindergarten students were evaluated at the beginning and end of a four-week period. One Kindergarten classroom had Education students while the other Kindergarten classroom did not have Education students. We explored whether learning about constructivist pedagogy and beliefs affects Education students' understanding of constructivism and children's self-regulation skills.

Methods

Preservice teachers

Eight female early childhood pre-service teachers participated in a 4-week course that incorporates the core principles and practices of Project Construct in a public school classroom setting. All participants had met the same necessary requirements for program admission in the teacher education program. Pre-service teachers were in their junior year which meant that they have had significant coursework and some field experience but have not experienced student teaching. The one pre-service who was randomly assigned to a classroom did not differ from the other students with respect to coursework or field experience.

Facilitator of Project Construct

A trained facilitator of Project Construct taught the 4-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 4-week class which met 4 times a week for 3 hours a day. Each student was randomly assigned to an elementary school classroom so as not to overwhelm children with too many Education students. This course took place in an elementary school where summer programming was taking place. The first half of the class involved the pre-service teachers learning about constructivism through lecture, discussion, and activities. The second half of the class was focused on applying those concepts to children in the classroom.

Pre-service teachers read about principles and practices of Project Construct through the Project Construct framework textbook and other constructivism reading materials (Project Construct, 2013). A portion of the class was spent learning about the developmental domains (i.e., social, cognitive, representational, and physical) and how these areas develop. Project Construct emphasizes the importance of developmental domains and provides practices that are appropriate for each child's developmental level. Pre-service teachers observed children in the classroom and discussed how children's behaviors or experiences are representative of developmental domains. For example, if children were using scissors to cut paper, such behavior would be categorized within the physical domain (i.e., fine motor skills).

Pre-service teachers learned about the ideas of constructivism which states that learning is a dynamic process of creating meaning from experiences where students learn to make sense of concepts through application with the teacher as a guide to scaffold their learning and offering them choices along the way. After having learned the philosophy of constructivism, pre-service teachers discussed what pedagogical practices align with these ideas and identified practices in the classroom that they were observing that were consistent and also inconsistent with such practices. For example, kindergartners were given at least 30 minutes of open-ended center time to engage in experiences of their choice (e.g., playing in the dramatic play area). This aligns with Project Construct, as children are given ample time to explore their environment and materials freely and construct their own knowledge. Pre-service teachers also saw children receive rewards for "good behavior" and discussed how this approach does not align with a constructivist framework. The idea of rewarding positive behavior is more in line with behaviorist approaches. Pre-service teachers had opportunities to observe and reflect on examples of constructive practices as well as non-examples or practices that do not align with constructivist teaching practices. Pre-service teachers also discussed misconceptions about constructivist practices. An existing misconception of constructivism that was discussed was that children get to do whatever they want to do in the classroom. Pre-service teachers learned about the idea that although children are given the opportunity to make autonomous decisions and use critical thinking, there are boundaries that will be held which often relate to safety.

Further, pedagogical practices that are consistent with constructivism were utilized in the course that the pre-service teachers experienced. Collaboration and co-construction of knowledge was emphasized in the course. For example, pre-service teachers had many opportunities for discussion and worked collaboratively on lesson plans and assignments. Pre-service teachers were asked many open-ended questions about the nature of constructivism to probe their critical thinking skills. Additionally, the instructor made attempts to connect pre-service teachers' prior knowledge with concepts of constructivism.

Pre-service teachers were often given autonomy and choices based on their interests and preferences. For example, pre-service teachers planned an art integration lesson plan and implemented it in the kindergarten classroom. Although there were constraints 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.

Children

Thirty-five children ($M = 4.85$ years-old; $SD = .42$; Male = 22) in two classrooms participated in the study. One classroom ($N = 18$) was randomly assigned as the experimental group and another classroom was the control group ($N = 17$). The control group participated in a curriculum called Summer Journey offered during summer school. The curriculum is focused on teacher-led academic activities (i.e., language, math, science, social studies). There was no homework or grades assigned. The summer program has incentive programs where students are eligible to receive rewards for attendance and positive behavior. All children were in summer school in a public elementary school in a Midwestern state. Only one of the Education students was randomly assigned to the Project Construct classroom. This was for two reasons; the kindergarten classes were the only classes that had more than one class and there was only one Education student who chose to be in a kindergarten classroom. Students were given the opportunity to choose the classroom that aligned with the grade level they want to ideally teach in the future.

Measures

Project Construct survey

We created a survey that captures the core principles and practices of Project Construct. Students' understanding of Project Construct principles was assessed through 30 statements. Many of the items on the survey were sampled from the Project Construct Early Childhood Classroom Observation Scale (PC-ECCOS). Students were asked to rate the extent to which Project Construct teachers should engage in the following practices on a 1 (Agree) to 5 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.

Child self-regulation

Children's ability to self-regulate was assessed through the *Head-Toes-Knees-Shoulders (HTKS)* (McClelland et al., 2014). The HTKS is a self-regulation task that assesses cognitive flexibility, working memory, and inhibitory control (McClelland et al., 2014). Children are given commands (e.g., "touch your head") and then asked to do the opposite of each command (e.g., "touch your toes"). There were a total of 30 test items with scores of 0 (incorrect), 1 (self-correct), or 2 (correct) for each item. Extensive research has shown that the HTKS is reliable and valid for 3-to 6-year-old children (McClelland et al., 2014). Higher scores are indicative of higher self-regulatory abilities.

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 8-week period ($M = 125.75$, $SD = 8.64$), $t(7) = -2.378$, $p = .04$ (Figure 1) (Table 1). 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 $t(7) = 2.646$, $p = .03$.

Children's self-regulation

A paired-samples t-test showed that children's performance on the HTKS grew significantly in the Project Construct ($M = 11.44$, $SD = 14.92$), $t(17) = 3.25$, $p = .002$ and control classrooms ($M = 18.20$, $SD = 18.54$), $t(14) = 3.80$, $p = .001$ over the course of the 4 week period (Table 2). However, there were no significant differences in HTKS scores between the experimental ($M = 11.44$, $SD = 14.92$) and control classroom ($M = 18.20$, $SD = 18.54$), $t(31) = 1.16$, $p = .127$ (Figure 2).

Discussion

The present study examined whether a 4-week undergraduate class affects pre-service teachers' knowledge of Project Construct principles and practices and child self-regulation. Results suggest that there was significant growth in pre-service teachers' understanding of Project Construct. Children's self-regulation grew significantly over the 4-week period in both the Project Construct and Control classroom. There were no significant differences between Project Construct and Control classroom, suggesting that the Control classroom performed equally well in the Project Construct classroom in self-regulation. These findings have implications for how we teach pre-service teachers about constructivism and the possible effects that it can have on young children.

Shift in constructivist practices and beliefs in pre-service teachers

Education students in the present study showed significant shifts in their understanding of constructivist practices and beliefs over a 4-week period. These changes could be attributed to a variety of factors. One element is the opportunity to learn and use constructivist approaches themselves in their college course. That is, Education students read about constructivist pedagogy and co-constructed their knowledge through significant discussion. Students were encouraged to think critically by being posed thoughtful and open-ended questions and given sufficient time to respond. Positive relationships serve as a foundation for Project Construct. Education students co-constructed classroom norms just as elementary students would at the beginning of the new school year. The instructor also engaged in a range of community building activities with the Education students at the beginning of the class. Education students created a song for their class that they would sing at the beginning of the class. These community building experiences led to the creation of a positive learning environment for the Education students.

Second, Education students observed examples and non-examples of constructivist pedagogy in an elementary school setting. One example of a constructivist practice that they observed was elementary students were given the autonomy to choose where they want to sit in the classroom. The elementary school utilized flexible seating in their classrooms. A non-example that students observed were teachers taking recess away as a punishment for problem behavior. Education students recognized that this is consistent with an approach where behaviors are controlled by punishment or approaches that discourage behaviors due to the fear of receiving punishment. There was lengthy discussion about how this approach as well as other behavior management strategies that rely on controlling behaviors with punishment or reward are inconsistent with Project Construct. They also often saw these approaches to be ineffective, as similar behaviors were seen throughout the course of the semester.

Third, the opportunity to apply constructivist pedagogy with young children in the classroom may have had an effect on Education students' understanding of constructivism. Education students spent every class period in the kindergarten classroom and had opportunities to interact with children. They engaged in a variety of community building activities with the young children by singing songs that included young children's names during group time. This facilitated strengthening of relationships between children and the Education student but it also served as an engaging literacy experience. Finally, Education students implemented an art integration lesson plan in the classroom that they spent time in. This art integration lesson plan involved a literacy standard and a visual art standard. The lesson also involved constructivist approaches, as children were given the autonomy to make choices within the framework of the lesson. For example, Education students engaged in dialogic reading and invited children to use a variety of art materials to display the main message of the story. 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. Due to the positive relationship that Education students had built with the children and the process and choice-based nature of the art lesson, children were engaged in the lesson and were able to represent and articulate the main message of the story. Furthermore, growth in student understanding of constructivism could have occurred due to congruence 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 alignment in belief systems within the systems, there is likelihood of greater shift in pedagogical beliefs and practice (Buehl & Beck, 2015).

Constructivism and child self-regulation

The present study found significant growth in children's self-regulation but no significant differences between the Project construct and control classroom. These results suggest that constructivist approaches are just as effective in promoting children's self-regulation as traditional curriculum. The key tenets of Project Construct are positive relationships, child-led experiences and autonomy. These elements have independently been shown to promote child self-regulation (Duckworth & Carlson, 2013). Yet, lack of significant effects may be in part due to limited power and the small sample size in the present study. This finding is consistent with some prior work which also did not show statistically significant intervention effects (McClelland et al., 2019). Another possibility is that Project Construct does not include specific self-regulation tasks, as the defining characteristic of Project Construct is to give children the autonomy to make choices. Finally, as with any intervention it is possible that with greater duration and dosage, we may have identified greater effects on child outcomes. Nonetheless, this is the first study to examine the link between constructivist pedagogy, pre-service teachers and children's self-regulation. We found that Project Construct implemented by pre-service teachers can be just as effective as a traditional curriculum.

Limitations and implications

The present study demonstrated that experience with Project Construct can affect pre-service teachers' understanding of constructivist beliefs and practices and children's self-regulation. There are some limitations to the study that are worth noting. First, the sample sizes for the Education students and the children were small and had limited power given that results were clustered at the teacher level. Future research needs to examine the effects with larger sample sizes. Second, although classrooms were randomly assigned to either the Project Construct or control classroom, the control classroom never had an Education student while the Project Construct classroom did. The inherent nature of having an Education student in addition to the lead teacher may have altered the classroom environment in some way regardless of the constructivist pedagogy that was being implemented. Future studies should have an additional classroom that includes an Education student but does not implement constructivist pedagogy.

Despite these limitations, there are significant implications for the present study. This is one of the first studies to demonstrate how exposure to and experience with Project Construct in a 4-week course in a public school setting can boost Education students' understanding of constructivism. The study showed that the opportunity to observe constructivist and non-constructivist pedagogy and applying constructivist practices can enhance pre-service teachers' comprehension of constructivism. This finding has implications for teacher education programs, as it can be challenging to affect Education students' beliefs and pedagogy. This work shows that education courses, even before student teaching

or practicum experiences, should include plenty of opportunities to use what they have learned and apply it to practice. This is important because Education students notoriously experience difficulty maintaining the knowledge that they have acquired through their teacher education program and apply them in their practicums. The findings also add credence to the idea that congruence in pedagogical beliefs between the teacher education program and the practicum context is important. Prior work has demonstrated that incongruence of pedagogical beliefs between the teacher and the school can have negative consequences for the teacher as well as children who attend the school (Buehl & Beck, 2015). To penetrate pre-service teachers' understanding of constructivism beyond a single semester, future work should examine how long Education students maintain these beliefs and practices and how much experience is necessary to sustain these pedagogical beliefs throughout one's teaching career.

Second, the present study found that a brief exposure to Project Construct practices can boost children's self-regulation just as much as a traditional summer curriculum. Another point worth highlighting is the idea that Education students were able to play a role in promoting children's self-regulation, not seasoned coaches or teachers. Perhaps, if future studies involved longer periods of time with respect to the intervention or experienced teachers, children may experience greater benefits than traditional curricula. This possibility needs to be more rigorously tested in a larger scale study. Overall, the current study treads new ground by examining the link between how experience with constructivist pedagogy can enhance Education students' knowledge of constructivism and in turn promote children's self-regulation skills.

Conclusion

The present study contributes to a novel area of research by demonstrating that the application of constructivist pedagogy boosts pre-service teachers' comprehension of constructivism. There was also evidence that experience with Project Construct resulted in gains in children's self-regulation. These findings suggest that a 4-week exposure to constructivism can shift future teachers' understanding of constructivism, highlighting the importance of application in teacher education programs. Further, Project Construct appears to have the potential to support children's self-regulation through positive relationships, autonomy and child-led developmentally appropriate practice.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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